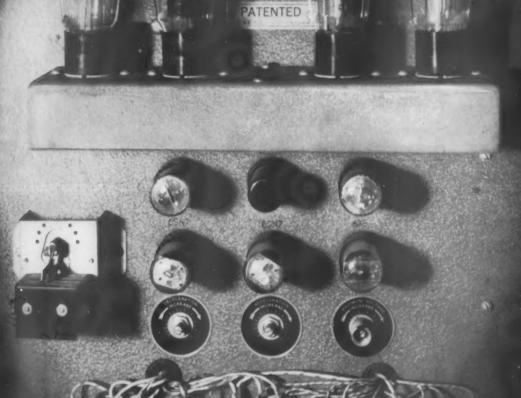
The Tool Engineer



ELECTRONIC CONTROLS FOR MACHINE TOOLS . . . Page 69

BLICATION OF THE AMERICAN SOCIETY OF TOOL AS

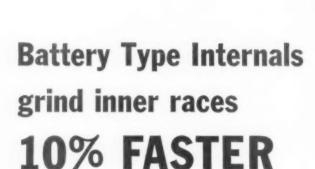


ENGINEERS

PLANNING ENGINEERING

OF EQUIPMENT PRODUCTION





Ten per cent may not seem like much. But in anti-friction bearing production, it's a pretty substantial increase. For these parts are turned out by the millions — and seconds saved per part mean hundreds of extra bearings per day. What's more, this increase is in comparison to previous production on high speed automatic machines. The savings therefore directly reflect the advantages of a Heald Battery Type installation.

> Within certain limitations, any reasonable number of battery type centerless internals can be used, depending

on production requirements. The important thing is the these Heald machines are specially designed for operation from a central hydraulic power unit, central coolant supply and central hi-frequency electric power source where ap plicable. Machines are smaller, permitting a more compact group assembly. Controls are designed for easier opera tion. And because they are fully automatic, several mo chines can easily be tended by one operator. That means important savings in manpower, as well as in initial invest ment, maintenance and operating costs. Remember-when it comes to precision finishing, it pays to come to Heald



WORCESTER 6, MASSACHUSETTS

Heald mackines speed the nation's production Branch Offices: Chicago . Cleveland . Dayton . Detroit . 169

100

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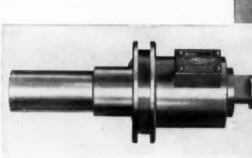
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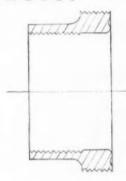
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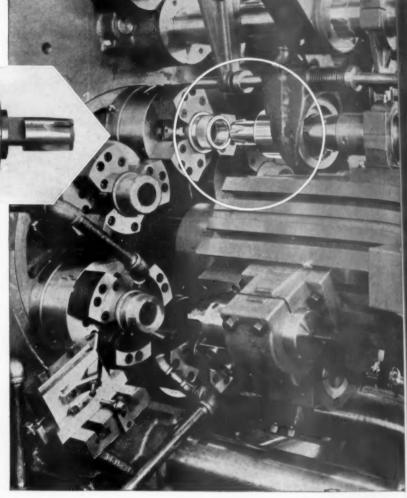
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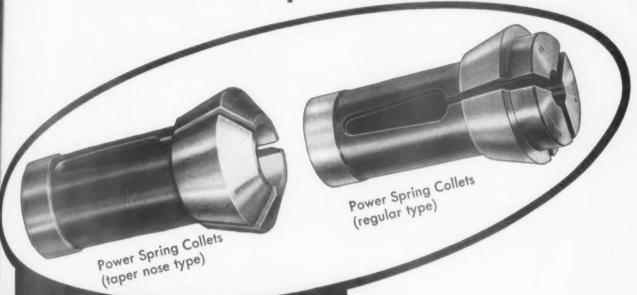
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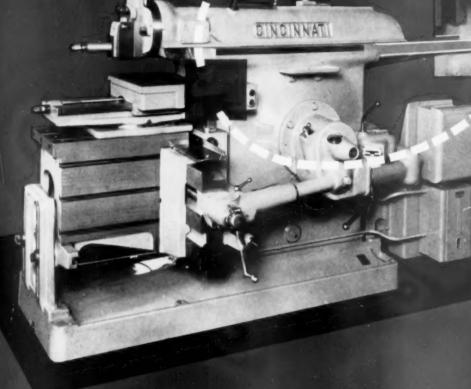
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— contains complete descriptions,
specifications and
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The New Cincinnati Electro-Magnetic Clutch and Brake alone brought a 30% time-saving here.

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MINOR in size yet a MAJOR new addition to



ES, Standard Gage, pineer of dial bore gages, as developed a still ewer type of dial gage r quick, accurate inpection of small diameter ores from .250" to .375". he ultimate in precision aging of small bores, TANDARD'S No. 00 is ased on an entirely new interchangeable disc" rinciple, surprisingly simle in design, easy to set nd easy to use.

Readily entered in bore

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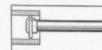
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Sapphire tipped gaging olunger and chromeplated centering-size discs nsure a long, trouble-free gaging life.

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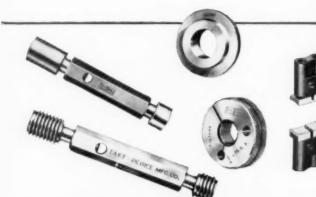
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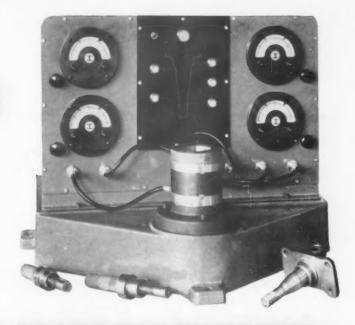


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TAFT-PEIRCE Makes the Right Gage for Every Application

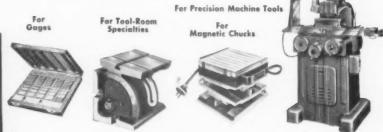
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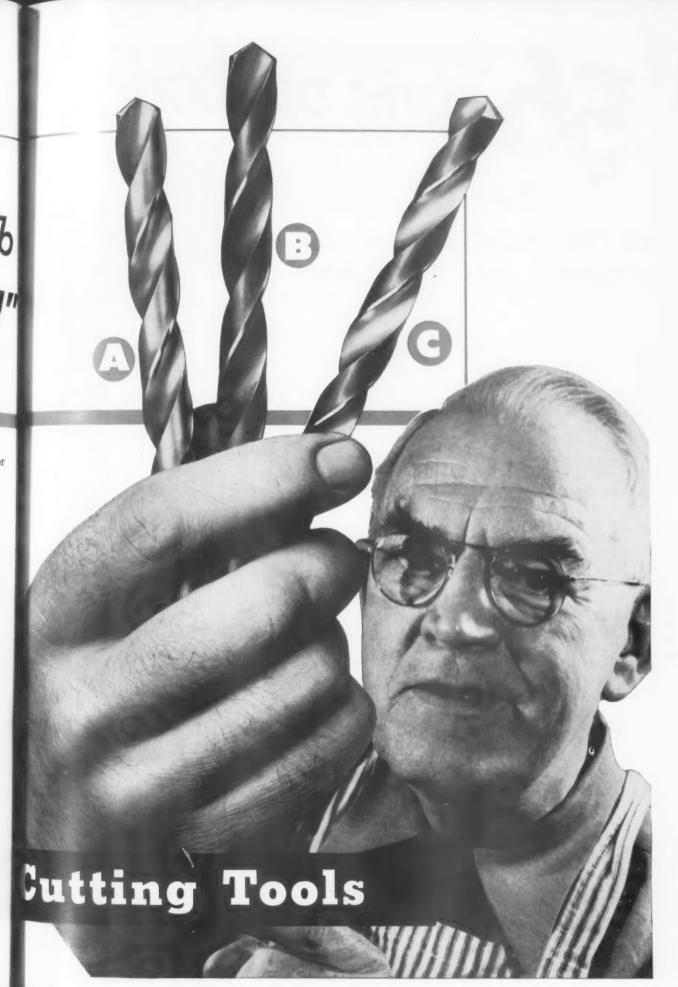
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"Know-How" of grooving

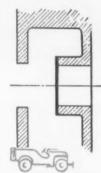
Wherever grooves, faces, chamfers, etc. are cut—whether internal or external—speed production, reduce costs on long runs

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SCULLY-JONES

AUTOMATIC RECESSING TOOLS

they do these operations on standard drill presses, radial rills, turret lathes and chucking machines, as well as a special machines. A single recessing tool is easily mapted to do various operations or a combination of operations. Adjustments regulating location and depth of groove are simple, fast and accurate. Types "J" and "C" pilot in a fature bushing. Type "R" pilots in, and moss on the work.

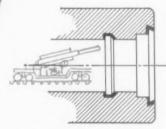


Facing An Internal Boss On Motor Castings Where Obstruction Usually Causes Difficulty.

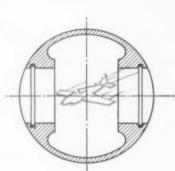
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Both Inside And Outside Clearance Grooves Cut In One Operation On Oil Tank Caps For Submarines.

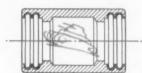
TYPICAL RECESSING-TOOL OPERATIONS



Formed Recesses Made In One Operation On Detonator Bushings Of Large Calibre Motorized Artillery Rifles.



Snap-Ring Grooves Cut In Wrist Pin Hole Of Airplane Pistons.



Casting Of Part For Army Tank On Which Two Recesses Are Made At One Time.

SCUITY -

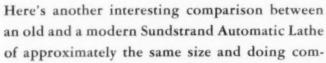
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showing types, sizes, specifications and prices.

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS





parable work. The old machine represented the latest in design

and production capacity of lathes built in 1929. Operations on the old lathe consisted of turning, grooving, chamfering and facing pistons at the rate of 16½ parts per hour. The modern lathe elliptically turns the O.D., faces the head,



RIGIDMILS

AUTOMATIC LATHES

HYDRAULIC EQUIPMENT

bugh, finishes and chamfers the grooves of automotive pistons. Production is 174 parts per hour.

There are several reasons for this tremendous increase in production. For instance:

12 Sundstrand Automatic Lathe Design Improvements Increase Production On <u>Both</u> Long and Short Run Turning

In addition to being able to produce more on turning mass production jobs on Sundstrand Automatic Lathes, you can also gain the advantages of multiple tooling on short runs. The quick cycle changeover cuts down the time required to change from one size and type of part to another. Lots as low as 20 pieces are being turned profitably on all four models of Sundstrand Automatic Lathes.

2. Greater Horsepower

To accommodate higher feeds and speeds through use of carbides.

3. Greater Tool Life

As a result of more rigidity in machines.

4. Greater Speed Range

To accommodate various types of metals and part sizes.

5. Greater Feed Range

To allow adjustment for proper feeds in various metals.

6. Greater Working Range

Including length of stroke, carriage adjustment, etc.

7. Greater Chip Area

and easier chip removal.

8. Greater Cycle Range

Provides more flexibility for more complicated cycles and tooling.

9. Hardened Slides

Carriage ways and slides are of steel, hardened and ground.

10. Better Materials

in gear trains, bearings, etc. for longer machine life.

11. Faster Set-Ups

Makes it possible to handle shorter runs.

12. Screw Feed Carriages

For more accurate and finer finish.

FREE

Additional Data

Get all the facts on these four modern Sundstrand Automatic Lathes. Ask for bulletins 719





SUNDSTRAND

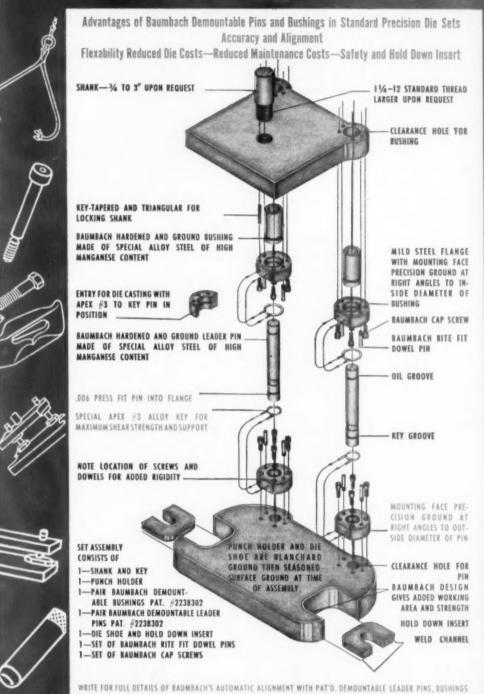
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DOALL





RODUCTION NEWS

AW BANDS . GAGING EQUIPMENT . TOOL STEEL . CUTTING TOOLS . INDUSTRIAL SUPPLIE

Published by The DoALL Company, 254 N. Laurel Ave., Des Plaines, Illinois

No. 4

UALITY CONTROL OF DOALL SAW BANDS LAKES POSSIBLE UNQUALIFIED GUARANTEE

bavy Band wing Made Easier ith New Ratchet Feed

Attachment Reduces
Operator Fatigue,
Assures Maximum
Fand Life and
Cutting Rate

A new hand-operated ratchet feed atthment that makes heavy band sawgeasier is now available for any MALL Band Machine. The feed can be add for either straight or contour sawg. It has a movable rack and levererated pinion with a mechanical adintage of approximately 9 to 1.

Use of the attachment permits conmous, controlled feed pressure, and assequent maximum cutting rate, withtoperator fatigue. At the same time, sensitivity of the unit allows the



Perator to "feel" the cutting action so hat he does not exert excessive feed ressure which would overload the saw and.

This inexpensive aid to faster and ore efficient band sawing is applicable the majority of sawing jobs requires a medium feed pressure. A demonstration of the unit will be made in any lant upon request.

83 Inspections Insure Users Maximum Blade Life and Cutting Efficiency

Users of DoALL saw bands on any make of horizontal or vertical band sawing machine are protected by the following guarantee:

"If any DoALL saw band fails to perform satisfactorily because of faulty steel, heat treating, dimension, set or tooth structure it will be replaced at no charge to the customer."

This quality guarantee is all-inclusive because it itemizes every physical component of a saw band. Even more important than the replacement of the blade itself is the assurance behind this guarantee that production efficiency is not apt to suffer due to poor saw band quality.



Samples are taken from every coil of raw steel for exhaustive inspection.

Saw Band Inspections

No manufacturer can afford an unqualified guarantee of quality without having an inspection system that insures a product as perfect as it is humanly possible to make.

Inspection of DoALL saw bands starts with a sample snipped from every coil of raw steel received. This steel is put through exhaustive examinations for thickness, width, camber, wedge, lip, edge roughness, edge radius, hard-



Microscopic examination of hardened saw band teeth.

ness, weldability, cracks, brittleness and carbide size and distribution. Failure to meet any single inspection means that the steel is returned to the mill to be sold for some less exacting use.

At every stage in the manufacturing process, DoALL saw bands are subjected to further examination—after "toothing", setting, hardening, annealing; even after packaging. Tooth formation, dimension, set, hardness after heat treating—these and many more critical factors must meet what are believed to be the most exacting tolerances ever established in saw band manufacture.

There are 32 DoALL Sales-Service Stores in the United States, two in Canada and one in Mexico, equipped to conduct free demonstrations of DoALL products in any plant upon request. You check the finest watch by the light from a star...

BUT...

what Constant

do you use to check

your precision

measuring instruments?



DoALL BLOCKS are available in sets ranging from six pieces to 118 pieces.

Doall Blocks
and accessories
you can measure them with
accuracy based on the
WAVELENGTH OF LIGHT...

with



Do All Four-range Electric Comparator Gage for measuring parts in thousandths or millionths.



New DoALL High Intersity Monolite for me urement with lig waves.

TO KNOW if your watch is accurate you refer to a master source of time measurement, the reliability of which is based on the constancy of the heavens. To KNOW that your gages and inspection equipment are accurate you must have some comparable master constant of linear measurement. In DoALL BLOCKS you have that master standard, for they have been held to millionths-of-an-inch accuracies, measured with light wavelengths—a linear constant that never varies under any conditions. And, DoALL will maintain that constant for you through periodic inspection and calibration of your Gage Blocks. DoALL now uses Mercury isotope 198 as a monochromatic light source for measurement of gage blocks.

Use the DoALL "light wave standard" for precision measurement in your plant and you will eliminate an important percentage of the inaccuracies that WASTE man-hours, materials and money. No plant that produces parts in thousandths is too small to need a master measurement control in millionths. There is a DoALL BLOCK set for every requirement. Ask for a FREE DEMONSTRATION in your plant.

THE DOALL COMPANY

DoALL square and round optical flats for use with a Monolite to "read" sizes, flatness or parallelism in millionths of an inch.





"The Science
Of Precision Measurem
—a new 256 page text by
prepared by DoALL, over
theory and use of equipment

measurement with light was terference bands; use of 9 blocks and accessories; state exhauses of Dimensional Que

sampling and techniques of Dimensional Qui Control. Price \$3.50—call your local Double Service or write to DoALL.









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. Tool Steel ... Band Tools

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Bullet Describes t-Saving Benefits of IL Ground Flat Stock

Is Prices of 238 Sizes
Hardening Tool
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nches, etc.

ALL Ground Flat Stock for use in ing dies, punches, jigs, fixtures, lates, tools and machine parts is ribed in a recently-issued 4-page



elletin. The bulletin explains that the tstock is ready to use on the layout ench, being accurate to size within very dose tolerances and having a finely round finish. The easy machinability, reedom from decarburization and other arface defects and other advantages re listed.

For quick reference a price list is induded covering 238 sizes of Flat Stock from \(\begin{array}{l} 4'' \times 18'' \times 1 \begin{array}{l} 4'' \times 10'' \times 36''. \end{array}\) teel analysis and heat treatment intructions are also given.

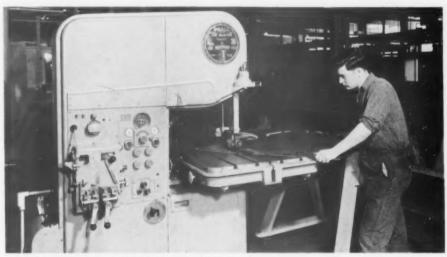
Copies of this bulletin are available pon request.

DoALL Diamond Band Cuts Glass, Rock, etc.

DoALL Diamond Bands, for use with the DoALL MP-20 Contour-matic Band lachine, will cut such materials as allet-proof glass, geological specimens, and carbon and other materials with the machinability ratings. The "teeth" re diamond particles imbedded in irtegularly spaced matrices which are ocked to the steel band. Inquiries are nited.

Friction Band Sawing of 10 Gauge Stainless 15 Times Faster Than Previous Sawing Method

Speed and Versatility of DoAll Contour-matic Band Machine Pays Dividends on Variety of Work at Albany Felt Company



FRICTION SAWING STAINLESS STEEL. 8000 band feet per minute is the operating speed used for friction sawing 10-gauge 18-8 stainless with the DoALL Contour-matic at Albany Felt Company. The new type DoALL Friction Saw Band used has teeth "locked" in place by a special heat treating process.

Albany Felt Company, of Albany, New York, one of the leading manufacturers of paper makers' felts and mechanical woolen goods utilizes the versatility and speed range (40 to 10,000 feet per minute) of a DoALL MP-20 Contour-matic band machine for cutting a wide variety of metal parts as well as woolen goods. The MP-20 was originally purchased to friction saw 10 gauge stainless steel used in fabricating of rotary fulling machines and washers for processing industrial woolens.

Previously the metal was cut with a reciprocating jig saw attachment on a drill press. Now it is friction sawed 15 times faster on the MP-20. Cuts are more accurate and the time required to fabricate the machines has been reduced.

Another time and money-saving benefit to Albany Felt is the ability of the Contour-matic to cut heavy mechanical woolens. This work was formerly sent out of town. Now in their own plant, using a DoALL ¾" double bevel knife band cutting at a speed of 6000 F.P.M., they are able to quickly and accurately cut great thicknesses of woolens. The



CUTTING WOOLENS. A DoALL double bevel knife blade is used on the Contour-matic for cutting heavy industrial woolens at Albany Felt Company. Band speed is 6000 feet per minute for this application.



SAWING STRUCTURAL MEMBERS. Here the Contour-matic is being used for cutting off an I-beam at Albany Felt Company. Other typical parts sawed on the machine are shown at the lower left.

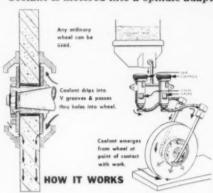
Contour-matic is also used to advantage on various production and maintenance jobs for both cut-off and contour sawing.

Local DoALL Sales-Service Stores are equipped to demonstrate in any plant, the versatility and the time, money and material-saving advantages of the Contour-matic. Literature is also available on request.

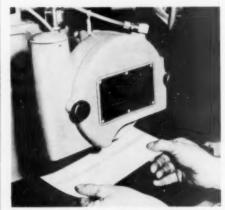
"Cool-Grinding"* Attachment for DoALL Surface Grinders Speeds Work, Improves Finish

Coolant Flows Through The Wheel, Out at Point of Cut; Reduces Temperatures as Much as 400°F

The "Cool-Grinding" attachment for DoALL precision hydraulic surface grinders makes it possible to take the heavy, accurate cuts of which the machines are capable without burning or checking the surface of the work piece. Coolant is metered into a spindle adapt-



er. From here it flows through the pores of the wheel and out in a fine mist at point of contact of wheel and work. Standard grinding wheels are used.



Blotter held under wheel shows leaves wheel as a fine mist right at point of

The advantages of this principle of application of coolant are numerous,

1. Coolant is applied at the point of cut where the heat is actually generated, a condition not generally attainable with ordinary flood cooling. Tests show that actual cutting temperature at point of contact are reduced as a as 400°F as opposed to flood coolin other words, with "Cool-Grinding" work is kept cool, whereas with cooling the effect is one of high ha point of contact with an immediate sequent "quenching" action which cause warpage, checking and skin ness of the work piece. Users cons ly report that heavier cuts can be si without burning.

2. The work piece is always days visible.

3. No objectionable grinding day formed.

4. Surface finish of the work pier smoother.

The advantages of "Cool-Grining are so readily apparent when actin demonstrated that nearly every DoAll surface grinder sold today is equin with a "Cool-Grinding" attach Demonstrations will be conducted in a plant upon request.

*Patent No. 2470350

NEW DECIMAL EQUIVALEN CHART. Real time saver for make fast calculations-fractions in 1/186 32nd and 64th and their decimal equi lents shown in different columns a colors for easy reading. Available

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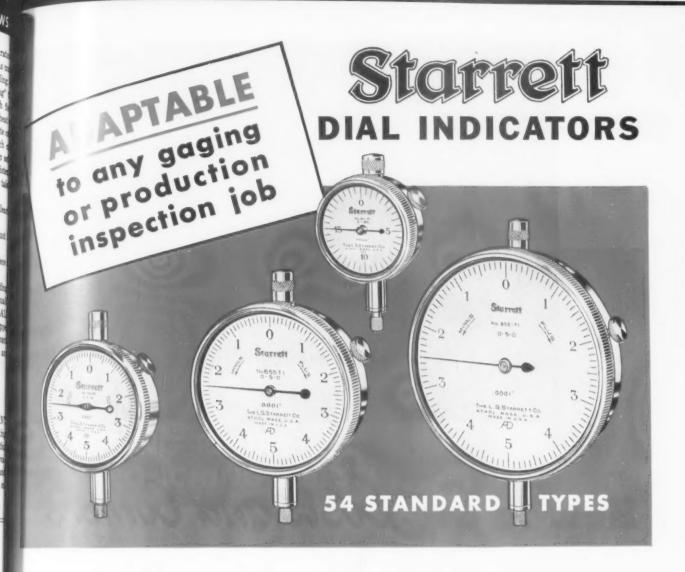
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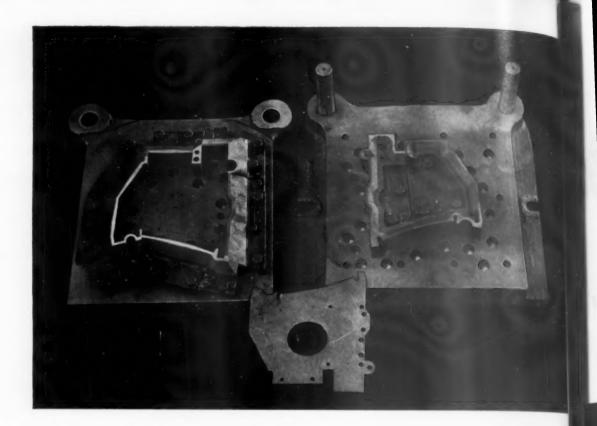
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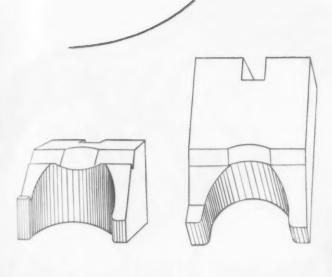
These prefabricated die parts consist of fine tool steel cutting edges, in a selection of grades, electrically welded by a special process to non-hardenable mild steel bases. Thus, screw and dowel holes may be easily drilled after heat treating, and there are numerous other advantages that will be immediately obvious to the die maker.

Thousands of die shapes may be made up from combinations of thirty-five standard sections. Specially shaped sections are manufactured to customers' specifications in five to ten days.

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BLENDING RADII? BROACHING'S BEST!

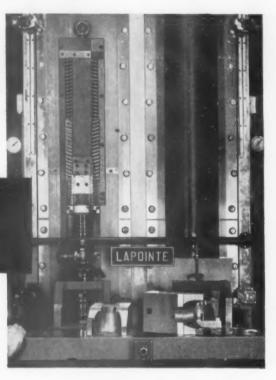
Take this 90mm. breech block, for example. It weighs 100 pounds and is of alloy steel. The shell clearance contour, while not extremely critical in dimensions, has two vital requirements:

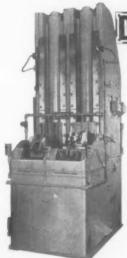
- A perfectly blended radii
- B extra smooth finish

Obviously, broaching is the perfect answer to both specifications ... and you get these results time after time, on every piece. No scrap, no rejects, no re-work.

> LAPOINTE DOUBLE RAM VERTICAL Broaching Machine shown here is 25 ton, 66-inch stroke with special in-and-out fixtures and special tooling. It is built in ten sizes ranging from 3 to 25 ton, and strokes from 30" to 90". A folder giving complete data on all broaching machines of this type is available on request.

> > Ask for Bulletin DRV-5.





BROACHING MACHINES

equipped with fixtures and tools that have been engineered for a particular job give you repetitive accuracy and production speedup.

LAPOINTE



pointe MACHINE TOOL COMPANY

Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

May, 1952

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-23

Rottleneck Bottleneck Colonial machine broaches 294 teeth

Tank Arsen removed on tank output turret ring g
Using conv time are red in each 6 for method of of a surfact teeth during now has be An ide tooth broach eccent

Working as a team, production officials of the Detroit Tank Arsenal and Colonial Broach Company have removed one of the tough production bottlenecks in tank output—cutting the big precision teeth in the turret ring gear.

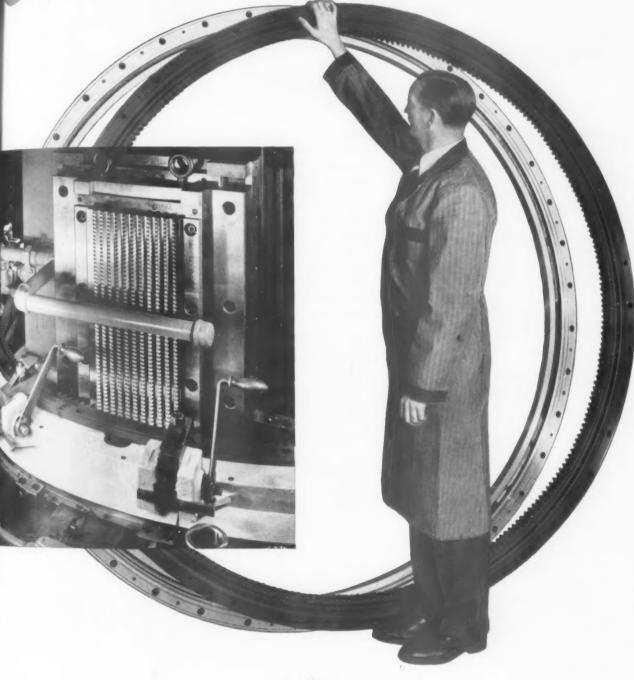
on Tank Turret Gears in 30 minutes!

Using conventional methods, 4½ hours of cutting time are required to produce the 294 four-pitch teeth in each 6 foot pitch diameter gear. By an ingenious method of indexing the gear AROUND the column of a surface broaching machine and broaching ll teeth during each cutting stroke, total cutting time now has been reduced to only 30 MINUTES!

An idea of the precision obtained is that no gear tooth finishing operations are required after broaching—yet spacing is held to .001 in. and eccentricity to .0005 in. per foot of diameter.

It takes a combination of imagination and long, practical experience to turn out installations like this—which not only speed output but cut costs and insure real precision. Colonial engineers give you that combination. They have been modernizing metal cutting methods for industry for well over a quarter-century.

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You'll want to know more about this P-M Pilot-Master line . . . the most versatile air control valves ever developed. Why not investigate today?

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2-Way, 3-Way and 4-Way Pilot-Master Valves

Integral pilot heads, solenoid controlled, are combined with main or "master" valve bodies to form these Pilot-Master Valves. Two series of 3-way valves, 36" to 11/4" I.P.S. Two series of 4-way valves, 36". 1/2", and 3/4" I.P.S.





2 or 3-way Pilot-Master Valve with Solenoid Pilot Head-Series B-2°











Series BB-I Master Valve

Actually two 3-way valves in one











Connect them to 3-Way or 4-Way Master Valves

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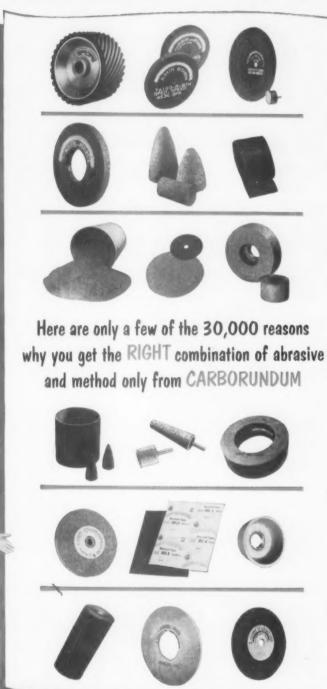
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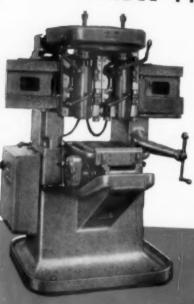
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SINGLE and DOUBLE SPINDLE TYPES



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Table working surface—14" x 18". Table top to spindle and, max.—8".

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Table working surface—24" x 39". Table top to spindle end, max. 13-5/8" single spindle; 10-1/4". The spindle.

40"TWO SPINDLE

Table working surface— $26^{\circ\prime}$ x 20°°. Table top to spindle end, max.—15-5/5° xingle spindle: $10\text{-}1/4^{\prime\prime}$ two spindle.

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Irregular shaped profiling cut (2" deep) is obtained rapidly and accurately in a large aircraft part.



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These Pratt & Whitney Machines provide top production and high accuracy for the profiling and milling of a wide variety of irregular shaped, precision parts. They are designed for fast, easy operation and are engineered for long life under gruelling production requirements. Our closely integrated manufacture of precision machine tools, cutting tools and gages assures the ability to meet exacting specifications for output, capacity and quality. Before leaving our plant, every machine is proved by rigid performance tests. Each part of every machine is finished, inspected and assembled to inflexibly high P&W standards for workmanship and accuracy.

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Production News

ABOUT LUSOL. - THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY . PORTLAND, CONNECTICUT

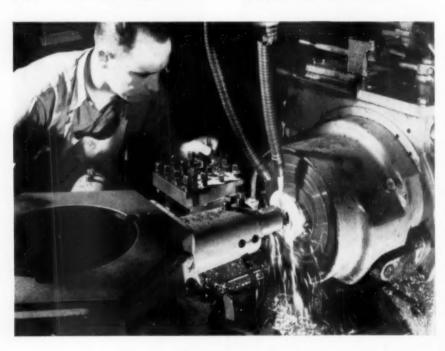
Why make SMOKE when you're cutting metals?

Smoke is the result of excessive heat. And heat means extra wear on tools and wasted energy, that could well go into additional cutting. Smoke is eliminated when you use Lusol, the all-chemical metal-working solution, in your machine tools.

Lusol, because of its unusual wetting power, gets to the points of tools where heat is generated. The result—no excessive heating to cause smoking and un-

necessary tool wear. Tools last longer, therefore, with Lusol. No smoke-filled rooms to cause labor unrest and impair workers' efficiency.

Right in your own vicinity there's doubtless a plant, using Lusol, where you can see what it has done for working conditions. Or prove it for yourself; we'll gladly give you the Lusol you need for testing it in your own plant and machines.



Labor likes SMOKEless Lusol machining

A company, faced with demands that smoke-filled air be exhausted from workrooms by huge fans, figured they'd have to rebuild their heating system to compensate for that loss of air. The machine shop foreman made a moneysaving suggestion; put Lusol in their machines and stop producing smoke.

users say*

case histories of Lusol at work

PRINTING PRESS MFGR.—
"Grinding wheels using Lusol cut
instead of rubbing, because Lusol
keeps the wheels so clean. They
don't load up."

AN OFFICE EQUIPMENT MAKER—"In surface broaching thin metals, there isn't sufficient mass of metal to carry away the heat. Tried Lusol; no heating, long broach life, fine finish, no discoloration or distortion."

A TOOLROOM FOREMAN—
"In surface grinding aluminum plates, metal heated up so much we could make another cut on the return pass without moving the wheel down. Lusol stopped that heating, because the wheel doesn't load up. Completes the cut in one pass."

A PURCHASING AGENT— "Been using Lusol for many moons. It's tops! Keeps machines cleaner, tools sharper, finishes finer."

*Users' names furnished on request.



FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 213E, Portland, Conn.

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THE TOOL ENGINEER

Publication of The American Society of Tool Engineers

The Tool Engineer

a Letter from the Editor...

The lay public has heard a lot in the past few months about the machine tool industry—most of it confusing enough that it probably has been pretty tough for the average newspaper reader to decide whether the industry has been holding up war production because of the lack of tools, or whether our government has been doing wrong by the industry by restricting it so that it can't produce, handing it orders that it can barely fill, and then when everything gets going good, knocking all the props out from under.

For us, one thing is certain. The tool engineer needs a strong machine tool industry. Unless it is strong, competitive and progressive, his ideas of better, faster and cheaper production cannot get from the planning board to the production line. And cycles of war production do not make a strong machine tool industry—they only make a very confused industry.

The idea has gradually been getting across to a lot of people that the boom-or-bust business cycle of the machine tool industry is not conducive to a healthy industry, nor is it conducive to a company's sticking its neck out too far in a bet on the future.

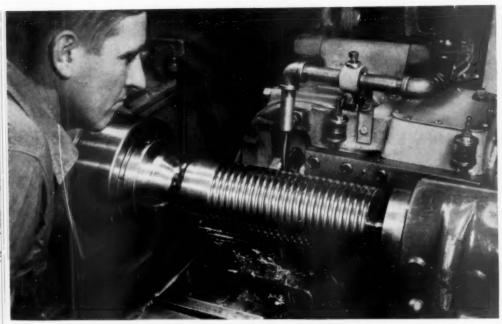
The question has been how to relieve this situation. As we have learned, the government has come up with an answer which involves stockpiling certain types of tools which require a substantial lead-time for procurement. Such a program would not necessarily mean wholesale orders, but it is figured that it would have a stabilizing effect on the industry.

What does the industry think of this? To find out, the editor directed the question personally to a number of builders during a recent tour. With one exception, the answer was no. The builders were specifically against a subsidy and its accompanying implications.

Is the answer, as many have proposed, a form of individually-tailored equipment depreciation which would allow a purchaser to write off a machine as it becomes obsolescent—not from a standpoint of years in service, but ability to do the job economically? Many believe so—both builders and users. This our government has not, to date, accepted.

The point is this. We cannot expect to indefinitely get originality and creative ability from an industry which suffers through exhorbitant ups and downs in its business cycle. At the same time a program which allows us as users to take advantage of newer, better machines as they are developed is certainly an important concern. It appears that it might be worth looking into.

Gilbert P. huin



THREAD MILLING A SCREW. Metal: SAE 2345 steel heat-treated to 28 Rockwell • Machine: Lees Bradner thread miller • Part: 5¼n adjusting screw for press brake • Operations: rough and finish thread milling Tool: high-speed steel • Feed: 0.260 depth on roughing Cutting Oil: Sunicut 105



BROACHING A GEAR KEY-W Metal: SAE 2345 steel forging 220 H nell • Machine: 3L8 La Pointe hydr broach • Part: gears for shaper, duced two at a time • Tool: 3' high-steel broach • Cutting Oil: Sument

SUNICUT 105 REPLACES THREE OILS AND SOLVES FIVE MAJOR PROBLEMS

Buying three cutting oils and then blending them to make additional grades had proved highly unsatisfactory to a machine tool builder. The smoke was noxious, employees complained of skin irritations, the color of the oils made it difficult to see the work, tool life was short and finishes not up to standard. To help solve these problems, the company called in a Sun representative and on his advice tested Sunicut 105 on the three tough jobs pictured here.

So good were the results that the company adopted Sunicut 105 for every machine in the plant and has used it exclusively for the past two years. The operators like its transparency. There are no complaints about smoke or skin irritations. Finishes have improved and tool life increased as much as 50 percent.

For complete information on Sun's cutting oils, write to Department TE-5 and we will send you a copy of our informative, illustrated booklet "Cutting and Grinding Facts."

CUTTING A LARGE GEAR. Metal: bronze 180 Brinnell • Machine: Gould & Eberhardt gear hobbing machine • Part: main drive worm gear wheel for large shear • 4256" O. D.; 5" thick; 87 teeth • Tool: high-speed steel hob • Feed: 0.006 • Speed: 42 rpm • Cutting Oil: Sunicut 105



SUN INDUSTRIAL PRODUCTS

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ditorial

Strength Through Participation

ASTE is a unique professional organization. It is unique in its vigor and in its government by its members. It is unique because of the tool engineer himselfand his talent for free, independent thinking and action.

This is an important point. It helps to explain not only the growth numerically of ASTE, but its growth in prestige as well. In many professional organizations, power is held and policy is made by a hierarchy of elders allied with rigidly fixed tradition. There is little awareness of the capabilities of individual members in the vast supporting society structure. There is little understanding on the part of the individual member of the workings of the organization.

ASTE was born with a touch of liberalism. Our history has proved repeatedly that there is no fixed traditional course, no arbitrary permanent thinking. Our thinking and our actions are flexible because the pattern of organization laid down by our founding fathers insures fresh blood throughout our Society, and guarantees a progressive approach tempered by the counsel of our elder statesmen.

Through the Board of Directors and the House of Delegates of ASTE, the expressions of opinion by individual members and the divergence of opinion which has resulted, have over the years created a professional group which can form a strong decision, have the courage to change or modify that decision should it become desirable, and above all can approach a new situation with the vitality and flexibility which only a strong, democratic organization can muster.

The course of ASTE thus far, and with God's help its future course, parallels in one strong respect our professional tool engineering procedure. With original ideas, we develop. Through free expression, we consolidate. With consolidation, we continue our progress.

PRESIDENT

1952-1953



An Analysis of Cost Estimating Principles and Practices

By Lawrence E. Doyle

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING UNIVERSITY OF ILLINOIS

Part I

A COST ESTIMATE is an attempt to forecast the expenses that must be incurred to make a product. The services and materials to be considered may differ from one product to another, but the techniques are based on the same principles whether applied to watches, automobiles, machines and tools, buildings, or anything else manufactured or fabricated.

A convenient distinction is sometimes made in industry between product and tool cost estimating. The distinction is mainly one of purpose. Product estimating is concerned with finding the costs of merchandise to be sold. It may be undertaken to establish the selling price of a product for a quotation or contract; to ascertain whether a proposed product can be manufactured and marketed profitably; to find whether parts or assemblies can be more cheaply fabricated or purchased; to determine the most economical method, process, or material for manufacturing a product; to study the economy of making revision in existing production facilities and practices, and to initiate means of cost reduction: to provide a standard of production performance and a control of actual operating costs at the start of a project.

Cost estimating may be only one step in fulfilling some of these purposes.

Generally, tool cost estimating is concerned with tools and other equipment to be used for production. Much product estimating depends upon tool estimating. However, the costs of tools often are estimated in different ways from products, and tool estimating is treated as an end in itself.

Product or tool cost estimating may be preliminary or final. Preliminary cost estimating is based on incomplete premises. A preliminary product estimate is often made for a new project or part

before designs and plans have been completed. A preliminary estimate of the total cost of tools is generally prepared at the same time. These estimates are required to decide whether to proceed with the project and find out how much money must be available to carry it through. Preliminary estimates generally are made for sizeable machine or tool projects, even for current production, to decide whether to develop them fully. For example, an automatic machine is proposed to increase the

Fig. 1. When special machines are needed for a particular job, an estimate is made as shown here, and the cost must be justified before the expenditure is made.

January 25, 1951

TL125208 - ADJUSTABLE SPINDLE RAIL TYPE TAPPING MACHINE

Operations Tap all boles in parts: 5142, 5146, 7698, 9169 6817, 5143, 3080, 4255, 3081, 5818, 6847, 6440, 5121, 7699, 5816, 4919, 64-2, 4256, 5146 and 3482.

Pattern Costs	\$ 688.00
Tool Room Labor	6,229,00
Steel and Iron	751.00
Worms and Morm Gears (Cleveland)	196.23
(2) 10 h.p. Westinghouse Motors 9 \$270,74 each	c 101, 48
(2) pairs HLS Boston Revel Gears 9 822.73 each	45.46
Boston Coupling PCH 30	8,00
(2) Pioneer Rollway Pumps AADX-2 9 820.57	41.14
Coolant Pump and Motor	80,00
(2) Cutler-Hammer AC Solenoid Operated Brukes .57 Torque-7".	
Brate Wheel Diameter @ *101.28	202,56
(2) Rotary Limit Switches - Mational Automatic Tool Co.	
₹-31207 ♥ \$168,30	236,60
(20) Matco Spindles (Special) @ 4260, bb	5,068,80
Additional Lead Screw Spindles for above to handle different	
eise tape	
Electrical Labor.	300,00
Miscellaneous Purchased Material.	
Pafair Bearings.	
Parnir mearings	

Total.,.....

Note:

There are also (20) Fleating Tap Folders, costing '105.00 each, needs for each set-up which have not been included in the above estimate.

A fixture costing approximately \$600.00 will be needed, but is n

No Engineering Costs have been included

TOOL DESIGN DEPARTMENT

John Smith Chief Tool Designer

Wm. Jones, Estimator

Presented at the 20th Annual Meeting of American Society of Tool Engineers, March, 1952.

rate of output of an article. A design showing the principal details is drawn up for estimating purposes. The estimator prepares a statement specifying the cost of building the machine, as nearly correct as possible. An example of such an estimate is given in Fig. 1. If the propect is then approved, a final estimate of its cost may be made after the design has been completed.

Final estimating is based upon fully developed production plans and designs. Thus, after the routings for production have been written, a product cost estimate may be made to prescribe the performance expected. A final tool cost estimate, like the one shown in Fig. 2, is based on a detailed tool drawing that is ready to go to the toolroom or be sent out for bids. A final estimate is expected to reflect the cost of each tool or production part with reasonable accuracy. The method illustrated in Fig. 2 is explained later in more detail.

Dividing Costs into Elements

The quickest way to estimate the cost of a product, such as a special machine, fixture, die, or production part, is to compare it as a whole with a similar project. An overall comparison is inaccurate in most cases for a number of reasons. These discrepancies are taken into account and corrected by dividing a job into elements that are estimated individually and added together for a close estimate of total cost.

Estimating on an overall basis is satisfactory in some cases where old and new projects are practically identical. The estimate sheet of Fig. 2 has spaces in its lower left-hand corner for entering the identification and actual cost of a similar job for an overall estimate. This method of estimating is represented as Stage I of Fig. 3.

The accuracy of an estimate increases but so does the effort as a project is broken down into more and more elements. The amount of breakdown varies with different circumstances. Typical degrees of breakdown are depicted by the successive stages of Fig. 3.

A somewhat better than overall estimate can be obtained by dividing the cost into two categories indicated in Stage II of Fig. 3. In that way the cost of fabricating a fixture, for instance, may be considered separately from other services such as design and run-off.

The fabrication cost of each part of a mechanical device is logically estimated by itself as indicated in Stage III. Assembly of the parts is also a distinct fabrication function. At this or later stages, certain auxiliary services may be given individual attention. For example, a specific estimate of the cost of engineering effort is commonly made for both tools and products. Other items estimated separately in many cases are special tools, patterns, testing,

run-off, packing, and shipping. Auxiliary services not estimated individually are accounted for in indirect costs.

The cost of a part is commonly based upon material, labor, and overhead as indicated in Stage V. As the breakdown of direct costs becomes more detailed, indirect costs are correspondingly segregated.

Where the labor for each part is found by estimating the time for each operation, as in Stage VI, or the elements of operations, as in Stage VII, overhead may also be allocated more precisely.

Each stage of Fig. 3 represents a general form of estimating procedure. However, many variations can be found. For instance, direct labor and material may be estimated in accordance with Stage VI, indirect costs at Stage V, and auxiliary services at various stages as convenient. The procedure in almost every plant shows some difference. As a general rule, tool estimating is done at Stages I through VI, and product estimating at Stages V through VII.

A Procedure for Estimating Special Machine Tools

The summary sheet in Fig. 1 is the form used in a leading plant to report on estimates of costs of special machine tools proposed to increase production. The estimate is made from a rough design of the machine. The estimator studies the drawing

Fig. 2. Final tool cost estimate is based on a detailed drawing ready to go to the toolroom.



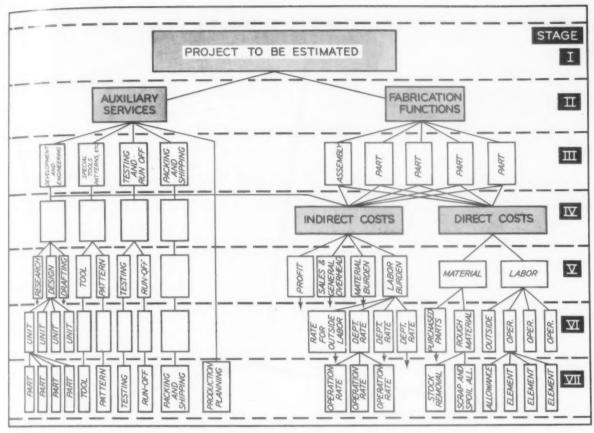


Fig. 3. Shown here are the progressive stages into which a project can be divided.

until he visualizes the nature of the project. He then makes a list of the details, which have not as yet been numbered or separately designated. He finds and specifies the catalog prices of those that can be purchased. The larger items are listed individually in the report; the smaller ones are grouped in the listing of "miscellaneous purchased materials." The estimator studies the details to be made and makes a list of the operations for each. The largest details are picked first and given the closest scrutiny, because it is most important to subdivide carefully the work for them. The time for each operation is estimated; they are added together, and the sum is multiplied by a rate that covers toolroom labor and overhead. The result is the amount shown as "toolroom labor." A different factory is used for "electrical labor." Rough material is estimated for each part. The totals are given in the item "steel and iron" and as part of "miscellaneous purchased material." Pattern costs are estimated for necessary castings.

Although no engineering costs are included in the estimate in Fig. 1, a companion estimate of development and engineering costs is made, based upon the time required for the rough draft, the time needed to finish the design, and the detailing of the parts.

The form in Fig. 2 represents a typical estimate made from finished tool drawings to find the costs

of building the tools. They may range in value from less than a hundred to several thousand dollars, but generally amount to several hundred dollars.

The estimator first studies the drawings to determine critical requirements and visualizes the nature of the work to be done. He then analyzes each detail in turn. If a detail is to be made, the cost of rough stock is estimated. The costs of purchased parts are based upon catalog or quoted prices. Prices have been estimated and tabulated in this plant for standard stocked details such as knobs, screws, etc. Details 11, 12, 13, and 14 in the example are standard, and their total cost is entered in the third line from the bottom of the sheet in Fig. 2.

Like most estimate forms, that in Fig. 2 does not reveal the full extent of the breakdown of cost in making the estimate. An estimate is given for the machine hours (direct labor time) for each detail that is made. The estimator lists the operations for each detail on a piece of paper and estimates the time for each operation. The operation times are added for each detail, and then the detail hours are added together on the estimate sheet. The total work time is multiplied by a rate. The hours for assembly and patternmaking also are estimated and multiplied by rates to get dollar costs.

The forms in Fig. 4 illustrate a procedure for

Fig. 4 shows sheets for tabulating prices of tools and other products involved when estimating a job.

estimating the prices of tools and other products of one factory. Figure 4A is a summary sheet made out in duplicate. The original is filed in the estimating department. A brief description of the nature of the job is entered on it to guide the engineering department if an order is received. In the example this is: "Make bar and assemble with standard #XR765 wear strips, cutters, etc." A carbon copy goes to the cost department where actual costs are entered in the last column on the right after the job is done. That copy then is returned to the estimator who files it under a code number where it can be found readily when another similar tool is to be estimated. Figure 4B is the work sheet for recording reference information about elements of the estimate.

The estimator may work from the customer's sketches or prints, a preliminary drawing from the engineering department, or a written request for a quotation if the tool is simple. The parts are specified on the work sheet. The cost of material and standard parts is multiplied by a factor to cover out-of-pocket handling costs. The estimated engineering time is multiplied by one rate; the machine hours by another rate that is larger because it includes factory overhead. Both engineering and production rates include direct labor, marketing, and administration costs and profit. Outside labor and heat-treating have their own rates.

One line of Fig. 4A calls for a marketing and profit ratio. That is not applied separately when the work is done in the plant because it is already included in the overhead. However, some products are purchased for resale without further fabrication, and the marketing and profit ratio is applied to them.

Short-run jobs in the factory are broken down into operations. The estimator specifies a time for each operation on a work sheet like the one in Fig. 4B. Such jobs average several hundred dollars in value, but a few amount to as much as several thousands of dollars. They are estimated approximately at Stage VI (Fig. 3). Where the cost is high, the initial estimates of operation times may be checked by a production official. The second estimate is the one used. Some jobs entail long runs of 1000 pieces and more. An error in estimating the unit price can prove quite costly. For accurate estimates, the production work is divided into operations, and they are divided into elements on other work sheets. The elements are assigned standard values established by time study. Thus, the estimating procedure for long-run jobs in this plant approaches Stage VII.

The sub-total of unit time is increased by an estimating contingency or performance factor on the work sheet in Fig. 4B before being carried to the summary sheet in Fig. 4A.

(Continued next month)

Strength of Bolted Assemblies

By John S. Davey

ASSISTANT GENERAL MANAGER OF SALES
RUSSELL, BIRDSALL & WARD BOLT & NUT COMPANY

Part I

Bolts and nuts have been used for centuries, but it is only in the last twenty or twenty-five years that engineers have given real thought to their importance and function. These fasteners are the muscles of machines and, like muscles, are responsible for the strength of the joints.

Only through standardization can economic production be achieved. The industry cuts up approximately two percent of the total steel tonnage each year: for this past year it was over two million tons. Each ton averages about 50 thousand pieces, which in a day's production is about 250 million. Considering types, graduated by sizes and lengths, the industry makes some 400,000 items. A great many of these are duplicate products which, if eliminated, would result in greater efficiency and lower costs.

Bolt and Nut Standardization

The American Standards Association has just published a new standard, "Square and Hexagon Bolts and Nuts, B-18." At first glance, it would appear that some products have been added, but actually this new standard can result in simplification.

For years the hex head dimensions of bolts and cap screws have been different. The bolt head was the result of good engineering design, while the cap screw was a "hand-me-down" from long existing screw machine practice. By coincidence, they were the same from $\frac{5}{16}$ through $\frac{1}{2}$ in.; above that, the cap screw was narrower across flats and thicker than the bolt head. Recent tendencies toward larger diameters and higher-strength screws proved the inadequacy of the bearing surface of the cap screw head, so it was discarded for the bolt head in all except the $\frac{1}{4}$ -in, diameter.

This new standard also corrects the duplication of nuts. For years light and regular nuts have been made to different dimensions. These nuts both have the same function and load requirements. At last they have been combined into one series.

The bearing area of a nut (Fig. 1), as well as a bolt, should be $1\frac{1}{4}$ times the stress area of the bolt thread. This results in $1\frac{1}{2}$ times the nominal diameter for the across flats dimension. The light series nut from $5\frac{1}{8}$ in. down fulfilled these requirements, but large sizes fell under this ratio and proved inadequate. The regular series, while in excess of the above requirements in the sizes below $5\frac{1}{8}$

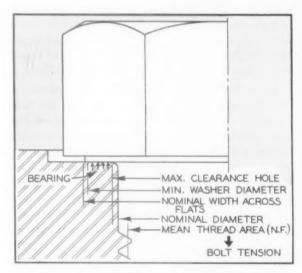


Fig. 1. The bearing area of a nut should be 1½ times the stress area of the bolt thread.

in., were in accord with them in the larger diameters. It was therefore decided to adopt the light series through $\frac{5}{8}$ in. and the regular series for the larger sizes.

Table I shows the present bolt head, the cap screw head, and the new head dimensions. In order to be strong enough to carry the loads required, the cross-flat dimension must be sufficient to provide a bearing area under the head of 1½ times the stress area of the threaded section. It must have

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TABLE 1—OLD AND NEW BOLT AND CAP SCREW HEAD DIMENSIONS (INCHES)

	Reg Semi Bolt	-Fin.	Old Hex Head Cap Screws		New Bolt & Cap Screw Head	
Bolt Diam.	Across Flats	Head Height	Across Flats	Head Height	Across Flats	Head Height
1/4	3/8	5/32	7/16	3/16	7/16	5/32
5/16	1/2	3/16	1/2	15/64	1/2	13/64
3/8	9/16	15/64	9/16	9/32	9/16	15/64
7/16	5/8	9/32	5/8	21/64	5/8	9/32
1/2	3/4	19/64	3/4	3/8	3/4	5/16
5/8	15/16	25/64	7/8	15/32	15/16	25/64
3/4	1- 1/8	15/32	1	9/16	1- 1/8	15/32
7/8	1- 5/16	9/16	1- 1/8	21/32	1- 5/16	35/64
1	1- 1/2	39/64	1- 5/16	3/4	1- 1/2	39/64
1-1/8	1-11/16	11/16	1- 1/2	27/32	1-11/16	11/16
1-1/4	1- 7/8	25/32	1-11/16	15/16	1- 7/8	25/32
1-3/8	2- 1/16	27/32			2- 1/16	27/32
1-1/2	2- 1/4	15/16			2- 1/4	15/16

sufficient head height to resist the shear force set up by the tension load in the bolt, and also to provide sufficient wrenching area to prevent crushing. As mentioned, the across-flat dimension works out to be $1\frac{1}{2}$ times the nominal diameter, and the head height $\frac{5}{8}$ times the diameter.

Note that the substitution of the new head for cap screws will affect designs only on $\frac{5}{8}$ -in. sizes and above. Since these head sizes are greater across flats, clearances around the head may have to be checked. The $\frac{3}{4}$ -in. diameter is $\frac{1}{8}$ in. greater across flats, while the larger diameters are $\frac{3}{16}$ in.

Table II shows the present light nut dimensions, the present regular nut dimensions, and the new combined series. The bearing area, here again, has to be sufficient to carry the load, which is $1^1\!/_4$ times the stress area of external thread, or $1^1\!/_2$ times the nominal diameter across flats. The nut thickness must provide sufficient shear area to prevent the threads from stripping. Approximately $7/_8$ times the diameter was selected as being ample thickness.

Here again, clearance around the diameters above 5/8 in. must be checked, since the nut is larger. There isn't any question that this light nut did not have sufficient bearing area on the large sizes, nor did it have sufficient body since the nut would spread.

One observation to be made is that the head and nut use the same wrench, with the exception of the 7/16-in. diameter. Here there is a slight difference between the nut and head, because the nut had to be adjusted up to the next sixteenth. It is so small, however, that it shouldn't give much trouble.

There will still be a heavy series produced, because it is recognized that where large clearance holes are necessary, a larger bearing area is required. Tool engineers are going to be responsible not only for design and material specifications but also for quality, if quality control is to become a reality. Quality control takes all the judgment out of the inspection department, and makes the inspector an automaton whose knowledge of the application of the product is of no use. In that event, the

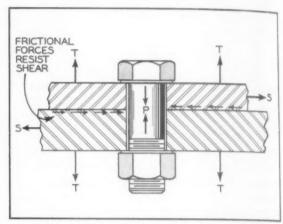


Fig. 2. Shown here is a rigid joint where the frictional forces resist the shear forces.

quality required will have to become a part of engineering specification. A lot of money can be wasted by over-restricting limits with the mistaken idea that quality is obtained.

Strength of Bolted Joints

The strength of a joint depends upon the amount of residual tension left in the bolt after the wrench is removed. Of course, it is necessary to have a bolt strong enough to carry the required loads, but other than that, the only element that makes a joint strong is this residual tension, or pre-load.

In a rigid joint, such as is shown in Fig. 2, the

TABLE II-LIGHT NUT DIMENSIONS (INCHES).

		ular n. Nuts	Light	Nuts	New or Hex	
Bolt Diam.	Across Flats	Thick- ness	Across Flats	Thick- ness	Across Flats	Thick- ness
1/4	7/16	13/64	7/16	7/32	7/16	7/32
5/16	9/16	1/4	1/2	17/64	1/2	17/64
3/8	5/8	5/16	9/16	21/64	9/16	21/64
7/16	3/4	23/64	5/8	3/8	11/16	3/8
1/2	13/16	27/64	3/4	7/16	3/4	7/10
9/16	7/8	31/64	7/8	31/64	7/8	31/64
5/8	1	17/32	15/16	35/64	15/16	35/6
3/4	1- 1/8	41/64	1- 1/16	21/32	1- 1/8	41/6
7/8	1- 5/16	3/4	1- 1/4	49/64	1- 5/16	3/4
1	1- 1/2	55/64	1- 7/16	7/8	1- 1/2	55/6
1-1/8	1-11/16	31/32	1- 5/8	63/64	1-11/16	31/3
1-1/4	1- 7/8	1- 1/16	1-13/16	1 3/32	1- 7/8	1- 1/10
1-3/8	2- 1/16	1-11/64	2	1-13/64	2- 1/16	1-11/6
1-1/2	2- 1/4	1- 9/32	2- 3/16	1- 5/16	2- 1/4	1- 9/33

tension. P must be greater than any external loads applied. As shown, the connection is metal-to-metal and, providing the modulus of elasticity approximates that of the steel bolt, it may be assumed that it is practically a rigid connection. In such a case, if the bolt is tightened to produce 1,000-lb tension in the bolt, a load up to 1,000 lb can be applied to this assembly without causing appreciable loading in the bolt.

This pre-load of 1,000 lb must be maintained through the life of the joint. Several things can dissipate this load, such as poor surface quality, burrs, rough castings, paint, foreign matter, Brinelling, crushing, or anything which tends to shorten up the grip length between the head of the bolt and the nut, causing the bolt to return to its original length. When a bolt is tightened, it stretches elastically 0.001 of an inch per inch of grip per 30,000 psi unit stress. This is, of course, within its elastic limit. For instance, a bolt, regardless of heat treatment or diameter, having an effective loaded length of 3 inches, which for practical purposes may be considered as the distance between the bearing face of the head and nut, stresses to 60,000 psi, has stretched 0.006 inch. As the bolt loses the 0.006

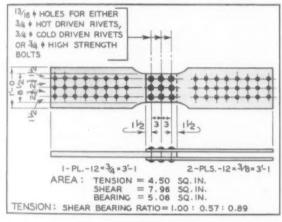


Fig. 3 shows details of the structural joint used in the test at Northwestern University.

inch, it will lose its pre-stress. It will stay tight as long as external loads are within the pre-load limit; otherwise it may not.

Another advantage of pre-loading is the resistance to fatigue. In fact, if the pre-load is greater than an applied load, the fatigue life of a bolt becomes infinite. The reason is that the increased pre-loading reduces the amplitude of stress change in the bolt to a safe value, provided the bolt material is comparatively rigid.

Pre-loading is also beneficial in providing a locking effect to avoid unscrewing. Excessive amplitude of stress change in a bolt has a tendency to cause the nut to loosen. The recommended way to

TABLE III—FATIGUE STRENGTH OF FABRICATED JOINTS.

Type of Fastener	Fatigue Strength at 2,000,000 Cycles at Full Reversal
Cold-Driven Rivets	14,700 Lb. Per Sq. In.
Hot-Driven Rivets	15,820 Lb. Per Sq. In.
High-Strength Bolts	17,200 Lb. Per Sq. In.

keep a nut on a bolt, if the materials are rigid, is by proper tightening.

Before leaving this rigid joint, note that if load *P* is sufficient, the frictional forces exerted on the contracting surfaces will resist shear. There will be no slippage, and, therefore, no bolt in bearing nor metal breakdown by metal fatigue.

This was proved quite conclusively at Northwestern University during some research work on fatigue strength of riveted and bolted joints. Figure 3 shows the detail of the structural joint used in the test and while it is a so-called structural joint, the facts apply to any type of joint. It consisted of a ¾-in. center plate and two ¾-in. outside plates. Nine ¾-in. fasteners were arranged in a square pattern. A fatigue testing machine was built expressly to perform these tests. It was a large duplex machine capable of testing two specimens at one time, applying loads of 250,000 lb at 180 cycles per min. These specimens were placed under alternate tension and compressive stresses of about 20,000 psi.

In all, twenty-four joints were fabricated and tested in fatigue under a complete reversal of load. Nine of the joints were fabricated with cold-formed, cold-driven rivets; six specimens were made up with hot-made, hot-driven rivets; and nine were held together with high-strength bolts having a yield strength of approximately 85,000 psi. The average values obtained for each type of fastener are shown in Table III. It can be seen that the fatigue strength of the bolted joint is appreciably greater than the hot or cold-riveted joints. Even this is not a true value for a bolted joint, since no bolted joint failed through the bolt section.

The superiority of the bolted joint brings out the fact that the clamping force of the fastener prevents the destruction of the joint more than does the fastener's ability to resist shear. If the clamping force is sufficient, all of the load may be transferred from one plate to the other by friction, without the fastener bearing against the sides of the hole in the plates. In fact, this is the ideal condition and can result in the gross section of the plates being the determining factor, instead of the net section through the holes.

Figure 4 shows this failure of the plates in a special joint that was bolted with only the four corner bolts in place; the other five holes were open. The failure of the joint occurred in the center

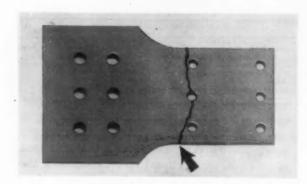


Fig. 4. The plates shown here in a special joint which were bolted only at the four corners. Failure of the joint occurred in the center of the plate with the crack starting at an open center hole.

plate with the crack starting at an open center hole, progressing toward the outer bolted hole, detouring outside this hole and on to the edge of the plate. In no case did the crack extend through any of the bolted holes.

The conclusions of these tests at Northwestern are significant. The fatigue strength of the joints was greater and the slippage smaller for the ones that were bolted than either of the riveted joints. The report states that these tests indicate the possibility of accepting bolted joints for structural members subjected to reversal of load. Another important finding is that no loosening of nuts was noticed, although one specimen was subjected to more than 3.6 million cycles and no locking devices were used. Another conclusion was that if sufficient clamping force is developed in the bolts of a joint, failure may occur outside the joint. The fatigue crack may not go through holes filled with highly stressed bolts.

What happens if the load is not transferred by clamping force, but by a loose bolt or pin in bearing? Professor L. T. Wyly, Head of the Department of Structural Engineering of Purdue University, in his recent research work, has brought out some interesting results on stress concentration due to the presence of a hole in a single plate under axial tension. Figure 5 (left view) shows the stress concentration at the sides of an open hole with a unit stress of 8 kips per sq in. (a kip is 1,000 lb) on the gross section to be about 27 ksi, or 3.4 times as large. He states that the minimum stress concentration factor of a wide plate would be 3 times.

The stress concentrations at the sides of a hole due to the slight clamping action of a hot-driven rivet are illustrated in the center view. Note that the clamping force produces a compression in the metal at the sides of the hole (since the metal tends to flow toward the hole) and hence may be expected to reduce the high tensile stress at the sides of the hole caused by the axial forces. For a member in tension, this clamping force should be beneficial.

It is also evident that the frictional forces developed as a result of this clamping will have an important effect upon the distribution of load and stress in the joint.

The right-hand view in Fig. 5 shows the stress concentration at the sides of the hole caused by the rivet bearing on main material at top of hole. With a 5-ksi, uniform tensil load, the stress concentration is 5 times the average stress on the gross section. Even more significant is the observed fact that stress at the sides of the hole is directly proportional to the bearing stress of the rivet at the top of the hole. In this case, the stress at the sides of the hole is 1.3 times the rivet bearing stress.

If the allowable stress of 27 ksi. is used at the top of the hole, the resultant equivalent elastic stress at the sides of the hole, due to this bearing alone, will be about 35 ksi., and the actual stress increment

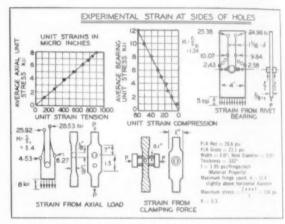


Fig. 5. Experimental strains at sides of holes. Shown at left is strain from axial load, and, at right, strain from clamping load.

will correspond to the stress produced elastically by a load of 35 ksi, so long as the elastic limit of the material at the sides of the hole is not exceeded. If this elastic limit is exceeded, the stress will be greater. Note that this is to be added to the stresses due to the presence of the hole discussed above.

It would seem from this that it is better to prevent the high stresses by insuring that the plates be fastened by a clamping action which will prevent bearing on the sides of the hole. This is exactly what was done at Northwestern, for not only was this stress due to the hole reduced, but the compression by bolt clamping caused the crack to go around this area, In other words, the efficiency of the bolted joint was over 100 percent. To insure that the bolts would not fill the holes in the tests conducted at Northwestern, holes ½6-in. larger than the bolts were used. This is an important point and will, when sufficiently accepted, make it possible for manufacturers to supply bolts with undersize shanks.

(Continued next month)

How to Save Diamonds

By Robert Innes and A. R. Conti

CARBIDE TOOL COMPANY

Derive the last year, most users of diamond impregnated grinding wheels have realized that adequate stocks of wheels can be maintained only with great difficulty. The diamond wheel grinding has always been costly, but the problem has lately been complicated by two factors.

There is first of all initial cost of the diamond wheel. Like most other supplies, these wheels have been increasing in price. One easy way of checking this is to determine wheel costs in terms of a percentage figure of total cost of sales. This percentage in the average company will be not only alarmingly large but will appear as a constantly climbing curve. This not only affects burden rates and therefore profits, but puts a greater strain on Maintenance, Repair and Operating supply quotations obligatory under National Production Authority Regulation 5.

The second factor which emphasizes the problem more concretely is the shortage of wheels. This current shortage is caused by the fact that delivery of diamond wheels has so lengthened during the past year that no normal procedures can anticipate or schedule purchases to insure receipt of wheels in time. For example, major diamond wheel producers are now scheduling delivery of wheels containing the most popular bort sizes, 150, 180 and 220 grit, from 12 to 16 months ahead.

Even the purchaser who has been far-sighted enough to place his orders far enough ahead to be able to live with this spiralling delivery schedule is not entirely safe, for he is made uneasy by the possibility of government directives being issued to release deliveries to prime contractors at the expense of subcontractors or tool makers.

The problem of conserving diamonds has attained increasing importance during the last 10 years because of the constant growth in the use of carbide-tipped and solid carbide insert tools.

It should be noted in passing that new departures from conventional grinding techniques, such as electrolytic grinding or method X, are not sufficiently explored or advanced to relieve the

situation now; and the need for conservation of diamonds is immediate and urgent.

There are several ways in which, without radical innovations and without departing from conventional grinding procedures, important savings in diamonds, and dollars, can be effected. The discussion will be limited to saving diamond wheels used in grinding carbides.

Though the problem directly is one of grinding, since it is here that diamond wheels are consumed. it must be approached and can be considerably alleviated long before the grinding operation is reached. In fact, the machine tool builder, the diamond wheel manufacturer, the standard carbide tool producer, the tool designer, as well as the diamond wheel user, are concerned with this problem.

The builder of carbide tool grinders can in four ways contribute to the solution. First, many such grinders are provided with spindles of poor design. The spindle is either not heavy enough or is not provided with proper bearings. Strength and precision in the grinder spindle are vitally necessary to proper operation of the diamond wheel. Run-out, vibration and failure to maintain trueness can ruin expensive and scarce diamond wheels in a matter of hours. Second, many grinders are underpowered. Speed, and enough power to maintain that speed constantly, is another important contribution to adequate wheel life.

Third, grinders are frequently too flimsy in construction. The builder has concentrated on keeping down his manufacturing cost by putting less material into his machine. His lower cost means higher cost to the machine user.

Fourth, one very common fault in such grinders is poor design in the coolant system which fails to deliver coolant in sufficient volume to the diamond wheel. The grinding of carbides requires an abundance of coolant—or none at all. An inadequate or intermittent supply of coolant at the grinding point results in excessive heat, which in turn results in abnormal wheel wear.

These points should be looked for when pur-

chasing a carbide tool grinder using diamond wheels: strong spindles provided with adequate precision bearings; adequate power; rigid well-built construction; efficient and generous coolant delivery. The owner of a poorly designed machine can, at moderate cost, make sure the spindle is put in first class condition and can replace standard bearings with precision taper bearings in his own machine repair department.

The maker of diamond wheels can help in the conservation of diamonds at the source by improving the design of standard cataloged wheels. Many of these wheels are faulty and lead to premature wheel failure through breakage. For example, a standard catalog item is a straight type DIT wheel 1/16 in. wide made without supporting hubs. These wheels are by nature very fragile and will fracture with slight side pressure. This wheel is very susceptible to warpage and must be constantly checked to avoid runout. Proper design could make waste through breakage unnecessary here. Another example of such poor standard wheel specifications is illustrated by the excessive diamond impregnation on cutter-grinder cup wheels. Diamond cross section in such a wheel need never be more than 1/16 in., yet is regularly offered by the manufacturer in catalogs 1/8 in. or thicker. Important savings of diamonds can be made here by a more determined

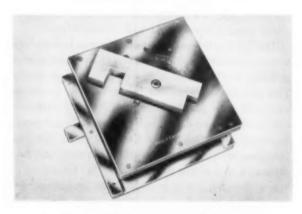


Fig. 1. The most inexperienced operator can lap carbide tools rapidly and accurately with this fixture.

effort at customer service by the manufacturer of wheels, and by the user if he insists on good design in the wheels he buys.

The contribution of the standard carbide tool producer to the conservation of diamonds can be very important though indirect. First, such producers should catalog and adopt as standard slash milling tip orifices, and abandon outmoded pocket milling. Not only does slash milling largely eliminate brazing strains, which in itself contributes to savings in grinding by greatly reducing the percentage of cracked carbide which must be replaced

and reground, but also facilitates initial top grind and regrinds. Again, the consumption of diamond wheels is reduced since the operator does not run into the steel shank while grinding the tip.

Another illustration of poor standard tool design from the point of view of diamond conservation is the specifying of carbide tips that are unnecessarily thick. This means that in grinding front and side clearance angles, large amounts of carbide must be removed from a tip which should do as efficient and economical a machining job if the tip thickness were reduced by 50 percent. An example of such a tool is the industry standard tool No. AR-90 stocked for non-ferrous machining with a ½-in. thick tip.

Designer's Contribution Vital

The tool designer as well can make an indirect but vitally important contribution to the program of saving diamonds. Except in very unusual applications, tools with a shank ½-in. in cross section or over can be slash-milled with no sacrifice in good tool performance. In even those instances where the designer feels some steel support is needed back of the carbide tip parallel to the cut, he can specify a step slash mill design which will give a steel backing to the tip, but with this backing held to half the height of the tip, or ½ in. high. The savings resulting from slash mill design have already been discussed above.

With the increasing use of carbide-tipped tools in the machining of steel, more and more use is made of chip breakers ground into the tip. Here again the tool designer can help the tool maker to avoid excessive use of diamond wheels by providing for adequate clearance of the steel back of the tip. again eliminating the danger of grinding steel with diamonds.

And finally, the tool designer can help by specifying a tip thickness adequate enough, but not excessive, to do the job required. The savings here are also discussed above.

But it is the last of the agents involved, the diamond wheel user, who can make the greatest contribution to the conservation of diamond wheels because the savings can be immediate. More than this, the user can save the most because he is in direct control of the expending of the wheels. Incidentally, by following several procedures, none of which are expensive or complicated, he can see direct savings in his operations.

Primarily, the problem is the same as in any other conservation program and that is one of education. No company can expect to cut its use of diamond wheels unless there is a sincere and concerted effort throughout its organization. Management, faced with dangerously low supplies of wheels, mounting wheel costs, government restrictions, etc., must initiate a coordinated program.

Care should be taken that rigid controls of diamond wheel stocks be initiated and maintained. A suggested procedure is to assign a serial number to each diamond wheel when received. Toolcribs should mark the date of issue on each wheel when issued. Checking diamond thickness on new wheels by micrometer reading and recording it on the wheel body can afford valuable information later as to the life of the wheel. Accurate grinding costs can be determined by this simple procedure. When practical, it is recommended that wheels be issued to individual operators and that fact recorded in toolcrib records. Placing the responsibility for care of the wheel can have a beneficial psychological effect.

Careful training of new or upgraded employees in the proper use of diamond wheels can result in important savings through avoidance of misuse or abuse of wheels. Emphasis should be placed on educating the new employee on careful use of wheels, correct wheel selection, grit size and hardness, recommended dressing technique, training in proper use of coolant, and most of all, respect for a valuable piece of equipment. All of these points should be stressed by supervisors. One single example of this is the common practice of grinding angles and swinging nose radii on the same wheel; this practice is costly in wheel wear since radius grinding must wear ridges in the wheel face; if the same wheel is used for grinding angles, these ridges must be first dressed out of the wheel. In such practice, most of the wheel is lost in the dressing operation rather than in the grinding operation.

Attention to grinding practices should not be limited to new employees alone; now is the time to observe how all grinder hands use diamond wheels. Many an experienced hand will guard a \$10 single-point diamond dressing tool with his life, but will, through carelessness or ignorance which poor supervision has never corrected, ruin a diamond wheel worth 20 times as much by bad grinding practice without turning a hair.

Another way in which the diamond wheel user can do something now about saving diamonds is to expand his use of holders and fixtures in connection with grinding. It will repay him many times over, for example, to make up holders for grinding flats on earbide round boring tools. The use of fixtures for grinding tops and angles on diamond off-hand grinders can save diamonds by eliminating uneven wheel wear inevitable by straight handgrinding off the table. In this connection, it might he noted that accurate milling of tip recesses and clearance angles on the steel shank of single-point carbide tools can save many diamonds in subsequent grinding operations by eliminating any chance that the finish grinder will have to grind steel and carbide. Close snagging of tips which must be formed from standard shapes, an operation

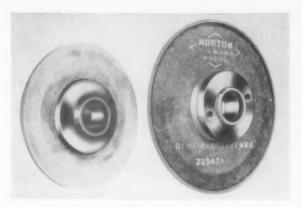


Fig. 2. These adapters make it possible to use the same dressed angle for both right and left ground tool bits.

that can be performed by silicon carbide grinding wheels, is also vitally important in saving diamond wheel wear on the later finish grind operation. A good rough snag grinder should be valuable to the intelligent supervisor.

Finally, every user of diamond wheels should take steps to salvage diamond bort in his grinding operations. Many companies have been doing so for some time and have realized important returns financially. Now one new factor of salvaging diamonds for themselves makes this step more vital than ever. There are two ways in which diamond bort is reclaimed: first, from the sludge or sediment collected from wet grinding systems, and second, from the stubs of used wheels. Care should be taken that sludge be carefully collected and segregated and that diamond wheels and regular grinding wheels are not used on the same machine, since a mixture of the two makes the salvage operation difficult and costly.

There are several reputable companies who reclaim diamonds from used wheels; experience with them will show that not all are equally proficient in reclaiming the greatest possible amount of diamonds. Incidentally, diamonds can now be reclaimed from vitrified diamond wheels.

It should be pointed out that the diamond wheel user who institutes regular salvage procedures can either sell the diamonds recovered to the reclaiming source, or can retain the bort for his own use. This may be advisable for it is possible to obtain good delivery on diamond wheels if the diamonds can be supplied to the manufacturer.

It should also be pointed out that the desired result in finish diamond grinding is not finish ground tools, but tools not only finished but free from cracks in the carbide. If diamond wheels are saved by slighting necessary grinding operations or by using improper bonds or grit sizes, there will be no final saving of diamonds, for such procedures can only result in cracking, and this means waste of diamonds because grinding operations must be duplicated.

Die Design for Metal Drawing

By Charles R. Cory

ENGINEER IN CHARGE OF DIE ENGINEERING FISHER BODY DIVISION, GENERAL MOTORS CORPORATION

L HE FORMING of parts from flat sheets of metals is one of the most difficult and unpredictable of all die operations. Even with the best possible draw die design, the first sample panels of a difficult draw are often very discouraging looking, with waves indicating local areas of excess metal, or tears indicating stretch beyond the yield point of the steel. Generally speaking, panels are formed from a flat shape in either a draw die or a form die. There is a fundamental distinction between a form and a draw die, and sometimes it is difficult to make a decision as to whether the simpler and more economical form die can be used or whether a draw die must be used. Form dies are confined to producing parts in which there is no tendency to form wrinkles; where the process is one of bending; or for forming curved shapes where the metal is in a state of stretch.

Considerations for Binding

The cup-shaped part in Fig. 1 requires a draw die because a flat blank, if pushed into a cup shape, would acquire wrinkles of excess metal in the cup walls and flange. The arrows show the movement of the edge of the flat blank K as it moves into the position G to provide the extra metal required to make the cup walls. Since the arrows converge there is a condition of excess metal.

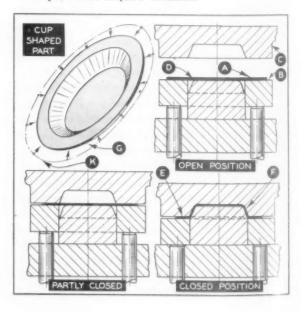
The blank A is loaded on the air binder ring B which is supported by air pins extending down to the air cushion in the bed of the press. On the down stroke the upper binder member C contacts the blank and forces the binder ring down, as the punch D pulls metal out from the binder surface to form the part.

During this draw action, the outside rim area of

metal *E* is held flat and free from wrinkles by the air pressure. There will be no wrinkles either in the angular walls *F* of the cup, because the blank holder pressure restrains the metal from pulling in where it is not actually needed. The entire area of the part inside the binder surface is in a state of stretch, so there is no excess metal or wrinkles.

The binder pressure must be sufficient to do two things, prevent wrinkles forming in the binder area, and restrain the metal from pulling in except where it is needed. The amount of binder pressure that can be used is limited by the danger of the blank metal tearing instead of pulling through the binder surface. If the air pressure of the binder ring is not adequate to restrain the metal from pulling through the binder surface too freely, a toggle press draw die is used.

Fig. 1. The cup-shaped part requires a draw die because a flat blank, if pushed into a cup shape, would acquire wrinkles.



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Margin of Safety Between Wrinkles and Tears

Fig. (Section X-X), shows a sidewise crosssection of such a toggle draw die in an open position. The steel blank A is loaded on the die member B, and tests on the binder surfaces C and D, sagging across the intervening space. The upper binder ring E is attached to the outer ram of the press (not shown) and operates independently of the punch F which is attached to the inner ram of the press.

Section Y-Y shows the die in a partly closed condition. The upper binder ring G has moved down with the outer ram of the press so that the binder surfaces H and J are closed on the blank, squeezing the blank metal on a ring-like binder surface all around the outside of the blank. As the outer ram with the binder ring G remains stationary or dwells, the inner ram of the press makes its downward stroke, bringing the punch K down to force the blank metal to the shape of a roof panel, as shown in the closed die position view, Section Z-Z.

To further restrain metal from pulling inward through the binder surface, draw beads L are attached to the upper binder ring. The metal must flow inward through the washboard-like surface. These draw beads are added at die tryout unless previous experience with the same type of panel has established the need for them. Usually a fairly difficult draw requires one continuous row of beads around the panel except at the corners. Wherever there is an unusual need for metal to flow in from the binder, the draw beads may be partly ground off. Wherever there is a tendency for too much metal to flow in, a second or third row of draw beads is used.

Strangely enough, the addition of draw beads does not increase the tendency of the metal to tear, since with the addition of beads the blank holder pressure can be reduced. The flow of metal can be further facilitated by spotting the binders together with more clearance for the blank than usual, or by notching the blank so as to reduce the width of blank metal in the binder at such regions.

Part of the tryout work on a draw die is to develop the smallest blank which will successfully draw with a reasonable broken panel scrap rate, and with the cheapest or most procurable type of steel stock. There is, necessarily, scrap to be trimmed off a drawn stamping in subsequent trim operations, but the amount of scrap should be kept to a minimum.

It would seem, then, that any panel could be made by the simple expedient of applying enough binder pressure or by adding enough draw beads to the outside ring of metal in the binder surface to prevent wrinkles or waves of excess metal from forming in the panel surface. Unfortunately, the blank will tear if the metal tension from this stretching action should exceed the yield point of the steel.

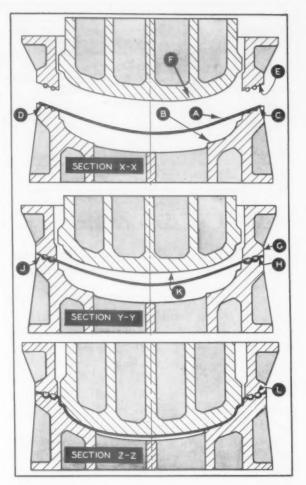


Fig. 2. In these three sections are shown the forming of a roof panel.

The question of whether a certain panel as designed can be produced is a question of whether there is enough latitude between that binder pressure which will not permit wrinkles and that binder pressure which will not cause the blank to tear. In these days of uncertain steel quality and scarcity of deep drawing steel, it is necessary to have a greater margin of safety between wrinkles and tears, or the percentage of panel scrap will be prohibitive.

Inequality of Developed Draw Lengths

Fig. 3, Section X-X, is a lengthwise section of the die member only of the roof draw die. The rear window shape A is formed by the action of a bottom punch B attached to the bottom ram of the press, which makes an upward stroke after the upper punch has formed the rest of the panel. It may be that shear steels, to be described later, must be added in the window opening.

The roof panel is comparatively easy to draw, since there are no sudden changes in panel depth or sharp pockets. Although the roof is deep, it is also very large in area, permitting a great deal of stretch. The most difficult part of the draw is that area at the side opposite the belt crease at H.

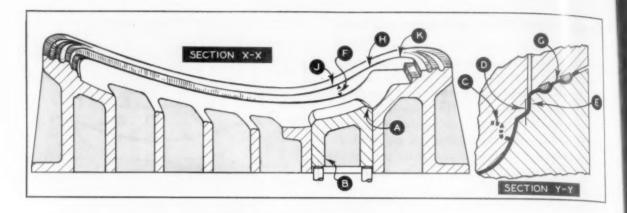
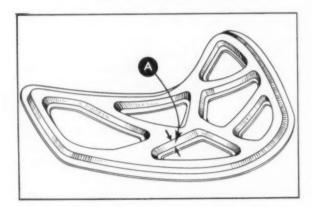


Fig. 3. This is a lengthwise section of the die member of the roof draw die.

The developed length of a cross-section through the roof at that point is considerably less than the developed length at J or K on either side. It is necessary to especially restrain the metal from pulling in too much at that point of lesser requirement. At that point, therefore, a greater number of draw beads and a greater binder holding pressure is required to keep the same amount of metal from pulling in as at J and K, which amount would be in excess of what is needed. At J and K the binder holding pressure is reduced to allow more free movement of metal inward.

Section Y-Y shows a partial section through the side of the roof. The finish shape of the door offset C cannot be drawn, since any forming in the draw die is limited to that which can be accomplished by vertical action. The developed trim line is shown at D on a trimming step. The vertical binder wall metal E (which is also shown in Section X-X at F), and also the metal in the binder surface G, are all scrap, since they are outside the trim line, a sort of necessary evil to produce the panel. The steel blank is stretched so much to keep out wrinkles during the draw operation that the flat blank size is actually smaller than the finished panel. The binder scrap in a sense of area only does not cost anything, since it is all stretch, although the thickness of the metal of the panel is decreased slightly.

Fig. 4. Shown here is a deck lid panel.

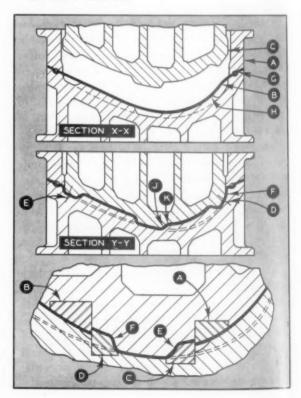


Drawing of Deep Depressions

The deck lid inner panel in Fig. 4 is a more difficult panel to draw because of the number of deep depressions. The extra metal necessary to form the wall at A, for instance, must come in the main from the edge of the panel.

Fig. 5, Section X-X, shows a deck lid inner draw die in that phase of its cycle when the upper binder ring A has closed on the blank B, but with the punch C still partly up. Section Y-Y shows the draw die in a closed position with the outside trim line at D and E. The binder wall F is necessary in order that the binder surface G will be at such an elevation that the blank B does not interfere with the die at H when the binders close. This panel is a difficult one to draw because of the deep depres-

Fig. 5. Here are the three stages in drawing the inner deck lid.



sions. Metal required for the inside wall of one of the depressions must pull through a series of angular walls and over many breaks. The pulling in of metal becomes progressively harder and the tensions in the metal are correspondingly greater as the die closes.

It is not practical to calculate just how deep and steep the walls of the depressions of the panel can be, or how small can be the plan view radius of the corners of those depressions. Experience with previous panels is a rough criterion, but the final decision comes at tryout.

If there is excessive panel breakage at tryout, the corners of the punch and die members at the bottom f and top K of those depressions are gradually ground for larger radii until the breakage stops.

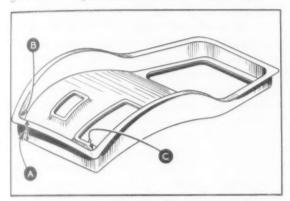


Fig. 6. The door inner panel is entirely drawn in except for the window flange.

Use of Shear Steels

Occasionally, it is necessary to add shear steels at these locations which will reduce the tearing (bottom, Fig. 5). These shear steels A and B in shearing past the lower steels C and D shear openings in the scrap of the lightening holes. At least some of the extra metal required for forming the walls of the depressions E and F can then pull from these sheared openings rather than come entirely from the outside binder surface.

This panel also illustrates the principle that the ability of metal to flow to a point of need decreases very rapidly with distance. Any depression remote from the panel edge must get the extra metal required for its walls from the stretch of the metal of the depression area itself plus a progressively rapidly decreasing amount of stretch from the adjacent area. For any given condition there is a distance beyond which there will be no movement of metal whatsoever.

Drawing of a Door Inner Panel

The door inner panel in Fig. 6 is entirely drawn in except for the window flange, which is not completely drawn in order that it can be trimmed in the same die as the outside flange and the various openings. The door inner draw die in Fig. 7 illus-

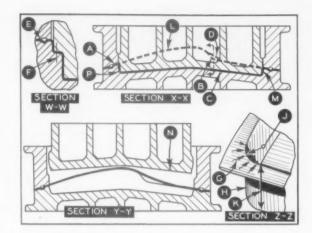


Fig. 7. The door inner draw die illustrates a condition where the outside flange area of the part is used largely as the binder surface.

trates a condition where the outside flange area of the part is used to a great extent as the binder surface.

However, at the belt turn under region the panel flange line B would be too steep and besides would make a poor binder line. It would be considerably longer than the punch line C, whereas the reverse is a more favorable condition. Since such a condition would result in excess metal, the binder at that region is straightened out as shown by the line D, which reduces the length and provides a flatter line to draw from. Section W-W through that region shows the binder surface E and the trim line F of the hem flange on a trim step.

Theoretically the binder line L, even with the flattening out to line D at the belt, is incorrect, since its length exceeds that of the punch line C. However, the great depth of the side walls P and M usually take up any lengthwise slack caused by the excessive length of the binder line in relation to the punch line. Section Y-Y shows the draw die in that stage after the binders have closed, and before the punch N starts the draw action.

The metal pulling in from the binder surface at the sill corners tends to crowd together as indicated by the arrows G of Section Z-Z and therefore there must be a great deal of binder pressure to stretch the metal enough to prevent wrinkles from forming in the wall H. The most difficult part of the panel to draw are the sill corners. Usually the plan view radius I is too small for the panel depth K, so that it is difficult to avoid tears from excessive holding pressure.

A trim operation is practically always used after a draw operation, because of variations in the distance the metal draws in from any particular binder surface. Although the trim line of the draw die in Fig. 7 is in the binder surface, the position of the trim edge would vary entirely too much for the accuracy required, if a predetermined blank were used with no trim operation after the draw.

Selection and Treatment of Die Steels

By Stewart G. Fletcher
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Part II

ALL DIE STEELS must be heat treated to develop in them the properties for which they are used. In recent years great progress has been made in the science as well as in the art of heat treating. All too frequently the die designer or dies maker does not appreciate the importance of correct heat treatment in developing the maximum of desirable properties, even though his first tendency when confronted with a die failure is to place the blame on the heat treater or on the steel itself.

Many shops which have their own heat treating facilities quickly become familiar with these problems; on the other hand, in some of them the heat treating set-up is considered a necessary evil, a good place to cut costs, and to save capital expenditure by using obsolescent equipment and little or no pyrometery. Such a department is often a source of trouble, for while tool design, engineering and operation is taking advantage of the higher alloyed, higher grade steels being developed, the heat treat lags behind because they cannot get the equipment and facilities for handling the better steels to produce their best properties.

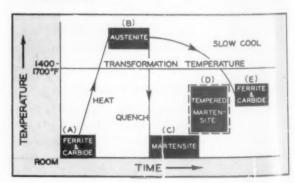
By far the greatest number of die shops, however, do not have hardening facilities of their own, but use a commercial heat treating establishment. Commercial heat treaters are usually able to do an excellent job of hardening die steels. They are aware of the necessity for control of surface condition, for minimizing distortion and size change, and for obtaining the hardness specified. However, they cannot harden complex dies made of water hardening steel so that they are free of distortion, or obtain the desired hardness on high carbon-high chromium air hardening steel when the wrong grade is specified.

Iron has two distinct and different atomic arrangements—one existing at room temperature,* and one above the critical temperature. Without this phenomenon it would be impossible to harden iron-base alloys by heat-treatment.

Briefly, what happens in the heat-treatment of die steels can be represented graphically by Fig. 2. Starting in the annealed, machinable condition at A, the steel is soft, consisting internally of an aggregate of ferrite and carbide. Upon heating above the critical temperature to B the crystal structure of ferrite changes, becomes austenite, and dissolves a large portion of the carbide. This new structure, austenite, is always a pre-requisite for hardening. By quenching it, cooling it rapidly to room temperature, the carbon is retained in solution and the structure known as martensite, C. results. This is the hard matrix structure in steels. It is initially highly stressed, for the transformation from austenite involves some volumetric expansion against the natural stiffness of the steel. so it must be reheated to an intermediate temperature, D, to slightly soften it and relieve those internal stresses and strains that unduly embrittle the steel

If quenching is not rapid enough, the austenite reverts to ferrite and carbide, E, and high hardness is not obtained. The quenching rate which will produce martensite depends primarily on the alloy content. Low alloy material is water or oil hardening, while highly alloyed steel usually can be hardened in air and quenched at a much slower

Fig. 2. Starting in the annealed, machinable, condition at A, the steel is soft, consisting internally of an aggregate of ferrite and carbide. Upon heating above the critical temperature to B, the crystal structure of ferrite changes, becomes austenite, and dissolves a large portion of the carbide.



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^{*(}and again near the melting point)

rale. The high alloys make the reactions more

Throu-hout all these heat-treating reactions, most die steels retain excess, or undissolved, carbides, which take no direct part in the hardening. The high carbon-high chromium steels, for example, have large quantities of excess iron-chromium carbide as shown in Fig. 3, which gives them in large measure the high degree of abrasion resistance possessed by this class of steel.

Indeed, the 4 percent vanadium steel owes its even greater abrasion resistance to the presence of excess vanadium carbide shown in Fig. 4. Vanadium carbide is exceedingly hard, having higher hardness than tungsten carbide, and even higher than the silicon carbide in grinding wheels.

Influence of Heat Treatment on Die Life

Fig. 2 presents the basic hardening of steels. Each type of die steel must be handled slightly differently than the others for optimum results. Different temperatures, different heating and cooling rates, and variable tempering procedures must be used. Depth of hardening, grain size, cracking tendencies, size change, etc. must also be seriously considered when setting up the detailed heat-treating procedure for any given die.

The properties of die steels developed in heat treatment bear an important and direct effect on die life. In general it may be said that the harder a given die, the longer it will wear, while the softer a die the tougher it becomes. Thus, assuming the proper die steel is being used and no other factors are operative, dies which are wearing out should be made harder for improved life, and dies which are breaking or cracking should be made softer.

Care must be taken to analyze the real cause for failure. Frequently dies spall or break because they first become dull, and extreme pressures build up. This is evidence for increasing, not decreasing, the hardness for added die life.

Within limits, heat treatment can be used to adjust these fine variables to best advantage. An oil hardening steel may work best on one application at Rockwell C 62, and on another involving higher stresses and shock at Rockwell C 58. Adjustments of the tempering temperature easily produce the hardness desired.

Hardness is not the only measure of effective heat-treating, for it is possible to produce equivalent hardnesses in nearly all die steels by different combinations of hardening and tempering temperatures and times, and usually one of these is superior to the rest. Many steels are very sensitive to slight overheating, their impact resistance and toughness dropping off considerably; yet the hardness may be virtually unaffected. There is no

simple test to determine whether a die has been slightly overheated in hardening, though such symptoms as undue size change, abnormal response to tempering, or loss of magnetism frequently indicate it.

It is evident, therefore, that temperature control is of great importance in heat-treating, and every effort should be made to use the proper temperatures for each grade of steel as recommended. The mere presence of expensive pyrometers is not enough. They must be properly maintained and frequently checked for accuracy, for at the high temperatures involved in heat-treating dies, it is easy for the thermocouples to become contaminated and lose their calibration. Errors of up to 200 deg F have been encountered from this source, yet the equipment appeared to be in good order.

Surface Control in Heat-Treatment

Another extremely important factor in the heattreatment of dies to secure maximum die life is that of surface control. This becomes vital on dies to be used unground or with a minimum of grinding and dressing after hardening.

Die steels are all high in carbon. The oxygen in the air, and the water vapor and carbon dioxide in burned fuel gases rapidly attack the carbon on the surface of the steel at the elevated temperatures used in heat-treating, unless the surface is adequately protected. The loss of carbon means loss in hardness, loss in desirable properties. No longer is the surface of the die the same alloy which was so carefully chosen, purchased, and worked into a die.

Surface protection has traditionally been provided by packing the dies, usually in a mildly carbonaceous material such as gray cast iron chips. Pack hardening does a good job, but is expensive to use inasmuch as fuel must be consumed to heat not only the die but also the box and packing material. Considerable time is also expended in proper packing, but on the other hand hasty work results in poor protection and spoiled dies.

More modern surface protection is provided by the use of special muffle furnaces, wherein the dies are protected from contact with the combustion gases and are surrounded by specially generated neutral atmospheres. Many atmosphere generators are used commercially today, most of them partially burning and reacting fuel gases to balance their composition to a neutral one between carburizing and decarburizing. On the whole, these are highly successful, and their use when properly controlled, results in dies with unaffected surface chemistry.

Salt baths are also growing in popularity for hardening die steels. They have long been used

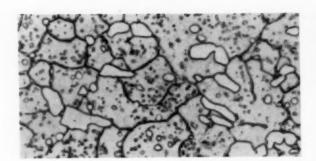


Fig. 3. High-carbon high-chromium steels have large quantities of excess iron-chromium carbide as shown here.

for high-speed steels with great success, and when correctly used, work out well for die steels also. The use of salt baths for treating dies does require very careful control, however. The highly alloyed air hardening die steels, for example, must be held at the hardening temperature much longer than either high-speed steel or the low alloy die steels to allow sufficient solution of the sluggish iron-chromium carbide in the austenite. The salt must be very clean and properly rectified to avoid surface attack on the steel over these long periods.

Another hazard in salt bath hardening is that of distortion resulting from the rapid heating obtained which may cause non-uniform heating of different size sections; however, the use of proper preheating normally takes care of this hazard.

Other Factors Contributing to Die Life

Even the best steel composition and most careful hardening cannot always assure success. There are several other major factors that contribute in large measure to successful die building.

Die Design. It is obious that the most important factor is die design.

Any design feature that builds up internal stresses in the die during heat-treatment, or that creates mechanical stress raisers, should be avoided. Among the former are such things as thin steel sections adjacent to heavy sections, where, in quenching, the thin section becomes cold and rigid long before the heavy section. If these are directly connected to each other, the transformation and thermal cooling stresses are built up to very high levels in heat-treating. This has the effect of reducing the possible safe operating stresses by an equal amount, preventing full utilization of the die and the properties built into the steel.

Another cause for premature die failure is the presence of sharp corners, or sharp re-entrant angles. These not only weaken the die structurally through acting as stress concentration areas during operation, but also produce high stresses in heattreatment, in some extreme cases actually leading to cracking. It is agreed that frequently sharp

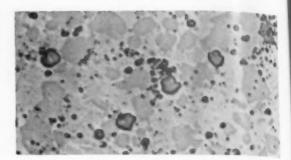


Fig. 4. Vanadium steel owes its superior abrasion resistance to the presence of excess vanadium carbide as shown in this figure.

corners, edges and re-entrant angles cannot be avoided.

In such cases, all that can be done is to locate the stress raiser in such a manner that its effect is a minimum, and then use every precaution in heattreatment to avoid undue distortion or cracking. In other cases, where the sharp angle is not required by die design, a fillet should always be used.

These are two examples of how die design might well influence die life through easing the problems in heat-treatment. Tool and die engineers should have a clear understanding of the behavior of steel during its heat-treatment, so that every effort can be made to avoid creating conditions which heat-treatment will render as weaknesses in the die.

Die Maintenance. Once a die is in successful operation, it must be maintained in good condition so that maximum performance is possible. This means its alignment must be frequently checked, cutting edges, if any, sharpened or otherwise cleaned up, lubrication controlled and frequent inspection carried out.

Preventive maintenance is the best way to avoid trouble. It is always good practice to have thorough inspection at definite stated intervals so that any slight deviation from normal operating conditions can be corrected before permanent damage is done.

One metallurgical trick that is frequently used on stamping or other forming dies subjected to repeated high stresses is to remove the dies from operation after a stated number of pieces are made and subject them to a stress relief anneal. Very often such an anneal, carried out at a temperature low enough to avoid undue softening, will markedly improve the life of the die by increasing its resistance to failure by fatigue.

Frequent resharpening has also been found to lengthen the life of cutting type dies. This prevents premature dulling from resulting in galling increased pressures and stresses, and early die failure.

Die Steel Quality. No mention has yet been made of another important factor in successful

(Continued on page 57)

The Part of Standards in Better Customer Relations

By Roger E. Gay PRESIDENT AMERICAN STANDARDS ASSOCIATION

The salesman and the engineer have helped America to develop the revolutionary industrial concept of mass production. The engineer made mass production physically possible. The salesman provided the mass market for this production.

Close cooperation will be necessary in the next few years to continue this task. Senator Ralph E. Flanders of Vermont, former president of the Jones and Lamson Company and of the American Society of Mechanical Engineers, said recently: "The fact that we have a high degree of standardization has made life simpler for us in ways so basic and so obvious that we do not even realize they exist. It has given us the free national market which we take so casually . . . it has given lower prices and better quality, more safety, greater availability, prompter exchange and repair service, and all the other material advantages of mass production."

These American Standards which are being established each day, from electric wiring to circus tents, from electric ranges to industrial machines provide the tools to help keep old customers and win new ones. A sales and distribution machine is needed in this country as good as the production machine the engineers have created. Goods must be moved in volume. Customers must be mass-produced on a vast scale.

This cannot be done without standardization. Standards are a stimulant to sales. They provide a sound basis for comparison by the customers, the men and women who purchase and use the products.

In industry and business, standards provide a quality and guarantee to help attract customers. Where there are no standards, or where they are inadequate or wrong, there are delays, lack of harmony and understanding, products that just don't fit, and the withdrawal of a customer from the market.

There is one way to successfully promote better

and more realistic standards. That one way is to take the customer's viewpoint into account so that the standards, when adopted, already have a large measure of acceptance. The idea is that everyone who is affected by the standards should help to make them—the manufacturer, the designer, the distributor, the seller, the consumer, the government. That is why orders for a material complying with the standard automatically start coming in as soon as a new standard is announced.

Effective selling is only one-half of the story. A recent editorial in *The Tool Engineer* magazine pointed out that without efficient, low-cost production, the salesmen can sell American industry into bankruptcy. Efficient, low-cost production is the tool engineer's job.

Methods of reducing costs are well known: inventory reduction and control, production costs curtailment, and cutting administrative overhead. While there are many ways of cutting costs there is no adequate substitute for expanding sales and for using with skill and vigor the tool of standardization.

When it comes to an understanding by many American people about what standards are and what they do, it is found that popular education has reached only the kindergarten stage. Strangely enough, the only thing that most people know about the American Standards Association is that it had something to do with screw threads.

Tool engineers, certainly, need no enlightenment about the importance of a unified standard of screw threads among the three English-speaking nations, Canada, Britain and the United States. And they certainly appreciate the momentous program for agreement on bolt and nut dimensions. And yet many engineers, even tool engineers, do not often grasp the implications of the standardization movement which is growing each day. From shirts to traffic signals, from musical notes to pots and pans, thousands of standards are being drafted and revised by executives and technical experts through the machinery of the ASA.

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This dynamic growth indicates that the best work in standards is ahead and is yet to be completed. Only the surface of what standardization can really do for American industry has yet been scratched. Work in standards during the next 50 years will far surpass any accomplishments of the past half century. Here is a new frontier, an expanding opportunity to achieve the American objective of raising wages and lowering prices through lower unit costs.

There is the case of the metal washers. One company found recently that it could reduce the number of metal washers it was using in its products from 1,350 varieties to 150 standard types at a saving of \$25,000 in one year. The question arises: "How did it happen they were using 1,350 varieties of washers in the first place?" The answer is obvious—there was no systematic standardization set-up in the company.

Materials Handling Concerned

Materials handling is another fertile field for the use of proper standards. Factory magazine estimates that every year American industry is wasting two billion dollars or 650,000 man years of work through inefficient handling of materials. New gadgets are not the only answer, although modern cranes, conveyor belts and fork lift trucks will help. Pallet loading, for instance, could be an interchangeable feature of the entire industrial and commercial transportation system. Again, good standard methods of packaging and standard pre-shipment tests might help reduce the breakage loss in transportation which is now at the figure of \$225 million per year.

Mr. Blanding's dream house is well known, but it is seldom realized how many small piles of waste parts remain when any house is built. The home construction industry, according to The Magazine of Building, can cut its costs by 20 to 40 percent with no loss in quality or living advantages of the finished house if it makes an all-out attack on waste. Working to standardized building codes, this industry can build a house with 50 percent less cast-iron pipe, 50 percent less cement, far less lumber, gypsum and steel and 75 percent less copper. There is a standard for the building industry based on four inches and known as modular coordination which, if adopted, can save the American people more than a billion dollars a year.

In industry, to greater or lesser degree, blueprints are a life line. Work is now underway to wipe out the differences between government and industry in making engineering drawings, a saving of untold millions of dollars and countless hours of labor.

A final example is a little closer to home. American industry has no generally accepted standard for allowances and tolerances for cylindrical parts and limit gages. An effort is now being made to develop such a standard under the sponsorship of the American Society of Mechanical Engineers

When discussing the need for these standards, it must be remembered that the American Standards Association does not originate standards of activities. It does not even make standards. It provides the machinery so that tool engineers and other interested groups can meet on a voluntary basis to develop standards by concensus. It makes it possible to develop a national standard known as "American Standard" where it is needed and demanded.

The job is to make the development of standards easier; to promote their use once they are developed; to eliminate variations and duplications of standards activities; and to weld conflicting standards into a single generally accepted national standard.

Here is how it works: All parties interested in a standard cooperate to bring it into being, the work normally being carried on under the leadership of one group known as the sponsor. The technical competence of the standards which are developed rests with the committee concerned and with its sponsor. The review by ASA has a quasi-judicial nature. The technical content is examined only to be certain there are no conflicts with standards already on the books. The ASA is concerned chiefly with the manner in which the standard was developed and with the votes in the committee on the final recommendation for approval. If there are negative votes, they must be accompanied by reasons.

There are two reviewing groups within the ASA. One is a correlating committee which covers the field within which the standard falls. The other is a small Board of Review set up to perform final reviewing and approving functions by and for the ASA Standards Council. They look at the makeup of the Committee which produced the standard to see whether any groups substantially concerned with the results of the standard were either denied an opportunity to participate or failed to avail themselves of such an opportunity. Further, if there are negative votes, the correlating committee and the Board of Review give careful consideration to the source of each vote and the reasons which accompany it. The votes are thus not merely counted but are weighed.

Voluntary standardization on the consensus principle is the heart of this philosophy. Even when the standard is approved, it is just one more step in a voluntary process. Initiation of the project, participation in the work of the committee and application of the standard—all are voluntary. So far as ASA is concerned, there is no compulsion

behind any of the 1,181 American Standards now in current standing.

Yet American Standards have a direct, immediate and dramatic effect on relations with the customers. They work because they help American industry produce economically and in a manner of immediate value to the consumer. In the days ahead these will be ever-increasing factors.

There is a new and interesting ASA project of tremendous importance. The American Academy of Pediatrics has requested help in developing safety standards for children's and infants' toys, clothing, furniture, and other equipment. They said that 12,000 children die every year of accidents, one-third of all children who die of all causes. Between the ages of one and 14, more children die by accident than from the next six most common causes of death.

Fifty groups have been invited to participate in the work, including medical groups, manufacturers, technical societies, trade associations, government agencies, women's clubs, etc. They are studying seven areas of concern; flammability of textiles for children's clothing; safe labeling of coatings and coated materials for toys and furniture; harnesses and sleeping garments that restrict movement; specification and design of wood furniture; construction and balance of baby carriages and strollers, large-wheeled toys, and all other toys.

The tool engineers have a vital role to play in the development of standards. To participate in the work of ASA it is necessary to understand what it is trying to do, to interpret its function to industrial colleagues, and to participate in its activities. Representatives from the tool engineering

profession are invited to join the 4,000 technicians and executives who are helping American industry to develop the standards it wants and needs.

The ASTE is an important member of the 110 groups that make up ASA. Individual companies, if not now members, have the opportunity of joining with 2,200 other companies in this organization. This cooperative and voluntary venture can only build a great future as a true clearinghouse of standards with individual, company and Society support. Then and only then can the national requirement for a comprehensive and unified system of national standards be filled.

There was a time when the lack of a national system of standards was simply an unfortunate economic deficiency. It was wasteful, but this was a rich country.

Those days are past and time is running short. The U. S. is rapidly becoming a have-not nation in a number of important basic commodities, including iron, lead and copper. The country cannot afford to continue to waste the mountains of money and materials that have been wasted through lack of standards. It cannot afford the old cross-purposes between the men who design and the men who produce, Production must not continue with Government on one level and industry on another, with an imperfect stairway between them.

A famous scientist has said that the last frontier left is not on the physical level but in the minds of the men who discover new truths, who devise new ways of applying these truths and who push back the frontiers of knowledge. Standardization is a new, bold, expanding frontier in modern life whose boldest adventures are still ahead.

Treatment of Die Steels

(Continued from page 54)

diemaking, and that is the quality of the steel being used in the dies. Die steels are selected for use by their chemical analysis combined with a vertain hext-treatment. Occasionally, dies may become failures through some defect in the steel itself.

Among the defects which might cause difficulty are hammer bursts, pipe, excessive carbide and alloy segregation. large non-metallic inclusions, and general porosity. Many of these defects do not appear until the die is in service, when they act as invisible stress raisers, causing early failure. Others may become visible during machining, or even final polishing of the die, or during heat-treatment after a great deal of time and money has been consumed.

The incidence of such defects is rapidly approaching the vanishing point, however. This is

because of improved manufacturing methods, which have all but eliminated carbide and alloy segregation, pipe and porosity, even from the highly alloyed air hardening steels.

Extensive use of ultrasonic inspection has brought about the detection of defects in the steel which cannot normally be found by other inspection methods. Ultrasonic inspection is invaluable in its aid to producing die steel free of damaging internal defects, and there is no doubt that it is rapidly becoming a standard inspection procedure for all types of quality die steels.

The best selection and heat-treatment of die steels for their many applications is determined by steel composition, special properties required, heat-treatment procedure, and heat-treating equipment available. These must be correlated with economic considerations, whether dies are to be long or short run, die design, and die maintenance to obtain the best possible selection in any given case.

Drill Jig Design

for Secondary Operations

By Joseph I. Karash

PROCESS ENGINEER
RELIANCE ELECTRIC & ENGINEERING COMPANY

Part II

The flipper bushing is faster in operation because it merely has to be flipped in or out of position. The slip bushing on the other hand must be wrung out, laid aside, later picked up, and wrung into the liner.

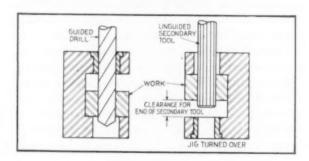
The flipper bushing is an integral part of the jig and will not become misplaced or lost. Theoretically the slip bushings should never be lost either, but somehow those things do happen. This is particularly true when there are several bushings for each liner, such as in guided reamer operations.

Disadvantages of flipper bushings. The flipper bushing is somewhat limited in application in that it has no means of guiding progressive tools. It is thus limited to applications wherein the secondary operation tool depends on the drilled hole for centralization.

In some cases the flipper bushing tries to climb up the drill due to screw action or chip pressure, causing the bushing to bind and "squeal" in the drill. This may be circumvented by starting the drill, retracting the drill and flipping back the bushing, reentering the drill and completing the

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Fig. 10. Fixed bushing method for performing drilling and secondary operations from opposite sides of a through hole.



drilling operation, creating an extra element of operation.

Fixed Bushing Methods for Secondary Operations

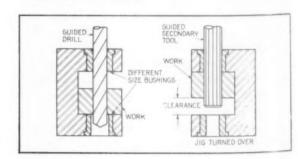
The fixed bushing method for secondary operations embraces through holes and blind holes. The blind hole method should not be misinterpreted as being applicable to blind holes only; in general, this method can also be used on through holes. However, the through hole method is limited to through holes, generally being not adaptable to blind holes.

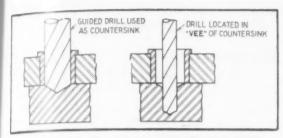
Fixed Bushings. A fixed bushing is one which is not removed from the jig during the operation cycle. Thus it is the use, not the type, of bushing that is really under consideration.

For example, if a conventional slip bushing arrangement (liner, lockscrew, bushing) happened to be in a drill jig, and the slip bushing is not removed during the entire operation cycle, to all practical purposes, relative to use, this would be a fixed bushing. Ordinarily the fixed bushing would be of the press fit type.

A fixed bushing has been defined as not being removed during the progressive operation. Re-

Fig. 11. If the secondary location tolerance is close, a fixed bushing may be required of both sides of the jig.





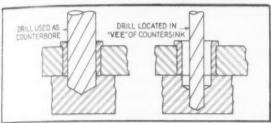


Fig. 12. Shown here is the countersinking performed by first using the end of a large guided drill, drilling only deep enough to produce the required countersinking.

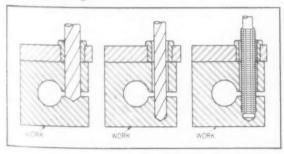
Fig. 13. If the bottom of the counterbored shoulder does not have to be square, the method illustrated here can be used.

membering that the progressive tool is always larger than the drill, a first impression would be that under such circumstances it would be impossible to accomplish the secondary operations. However, it is possible, within limitations, and sometimes very practical, to accomplish secondary operations using fixed bushings.

Fixed Bushing Method for Performing Drilling and Secondary Operations from Opposite Sides of a Through Hole. In the event that the hole being drilled is a through hole, it may be possible to drill from one side, turn the jig over and perform the progressive operation from the other side, thus enabling the progressive tool to reach the work. This is illustrated by the sketch shown in Fig. 10.

In this example a bushing is provided only for guiding the drill. The progressive-operation tool enters through an opening and is guided only by the drilled hole itself. The "location" points previously discussed will, of course, also apply to this example. Secondary operations ordinarily do not require guiding unless the hole location tolerance is close. For counterboring or countersinking with

Fig. 14. Here a split collar with a blind hole is counterbored, drilled and tapped using a fixed bushing.



this method, it is necessary, therefore, to design the jig so that the drilling is done from the bottom and the secondary operation is then performed after the jig has been turned right side up.

If the secondary operation "location" tolerance is close, a fixed bushing may be required on both sides of the jig as shown in Fig. 11. The smaller ID bushing fits and guides the drill. The bushing on the opposite side fits and guides the reamer. The use of this method should not increase the jig cost unduly. The two bushing holes (same bushing OD) might be bored through in one setup, or the bushing pads may be assembled and doweled in line.

In using jigs of this type the operator must exercise constant vigilance so as not to enter the reamer into the drill guide bushing. This would in some degree damage the cutting lips of the reamer. Similarly the operator should be careful not to drill from the secondary side, since this will result in an inaccurately positioned hole.

Clearances Required for Performing Operations From Opposite Sides of Through Holes. In using the above method, the designer should provide clearance in the jig for the end of the secondary tool. No such clearance is required for the drill. To clarify this, refer to Figs. 10 and 11. The end of the drill on passing through the work can readily enter into the opposite secondary tool bushing (without touching) because that bushing is larger than the drill. However, when the jig is turned over and the end of the secondary tool passes through the work, clearance must be provided so as to prevent the secondary tool from striking or touching the hard drill bushing. To sum up the above method, clearance on the drill bushing side is necessary; clearance on the secondary bushing side is optional.

Fixed Bushing Method for Blind Holes

Countersinking. In blind hole work, the fixed bushing method is limited to countersinking and counterboring. It does not apply to tapping and reaming, since these operations cannot be performed until the hole is drilled. On the other hand, with certain limitations, a hole can be countersunk or counterbored before drilling. This is illustrated in Fig. 12. which shows the countersinking performed by first using the end of a large guided drill for the purpose, drilling only deep enough to produce the required countersinking. Without removing the bushing, the smaller drill is then entered. The locating of the small drill is done by the V of the countersink. This is not an accurate method of locating the small drilled hole. but it will be entirely satisfactory for ordinary tolerances. In this manner it is possible to perform a progressive operation in a blind hole, using a fixed bushing.

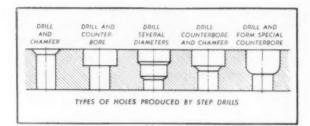


Fig. 15 shows common types of holes produced by step drills.

Counterboring. This same method may be used for counterboring if the bottom of the counterbored shoulder need not be square. This is illustrated in Fig. 13,

A fixed bushing is provided to guide the drill that will produce the desired counterbore size. The V left by this drill is used to center the next drill which will produce the required drill hole. If the angled shoulder of the counterbored hole is permissible, the above method may be used advantageously.

To illustrate this, a variation of this same principle is shown in Fig. 14. In this case a split collar with a blind hole is to be counterbored, drilled, and tapped, using a fixed bushing.

The first operation, counterboring, is accomplished using a drill of counterbore size, the counterbore being provided only to the depth of the split. This drill is guided by the fixed bushing. The second step is to use the tap size drill and drill the hole required for tapping. The third and last step is to tap the hole completing the operation cycle.

This one example, however does not introduce another basic method. It is only a variation of the previous example and is shown here to illustrate a common and useful purpose.

A Fixed Bushing Method Not to be Recommended. Occasionally a jig designer will think of performing a drill and ream operation through a fixed bushing by drilling first and then reaming. This has been performed in the shop, and though the method is not recommended, it may be worth while to explain this procedure.

A fixed bushing (reamer size) is provided as shown. First the drill is used and no attempt made to center it in the reamer-size bushing. The hole is drilled anywhere within this area, possibly locating against the side of the reamer bushing as shown. The drill is withdrawn and the reamer entered into the fixed bushing. The reamer bushing will force the reamer to cut a true positioned hole; however, severe binding and wearing action may occur between the reamer and bushing, due to the fact that one side of the reamer is cutting heavily and the other side may not cut at all.

It is true that this method will accomplish the

required operation, but the effects on the perishable tools and jig bushing are rather severe.

Step Drill Adaptations

A step drill is a multiple-purpose tool, such as is used for simultaneous drilling and counterboring operations. Some common types of holes produced by step drills are shown in Fig. 15.

These two step drills will perform exactly the same operation, the difference being that the dual cut type has separate cutting lips for both diameters and is much easier to sharpen than the plain type.

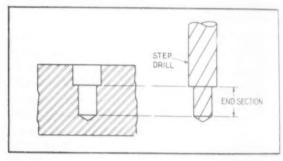
Step drills are generally made to order, and cost somewhat more than the conventional single-diameter stock drills. However, this cost may, under favorable circumstances, be repaid many times over.

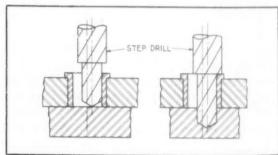
Step drill adaptations are discussed in conjunc-

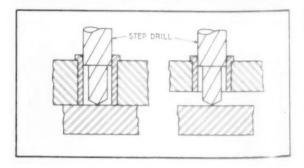
Fig. 16 (top). The nature of the work to be done will control the form of the step drill. Fig. 17 (center). If the conditions illustrated

Fig. 17 (center). If the conditions illustrated here were to obtain, the step drill would not function correctly, and the result would be inaccuracy and drill breakage.

Fig. 18 (bottom). The bushing contacts the step of the drill before the drill tip meets the work. Here it is accomplished in one case by leaving a clearance between the bottom of the bushing and the work, and in the other by using a longer bushing.

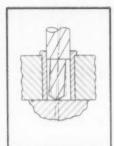








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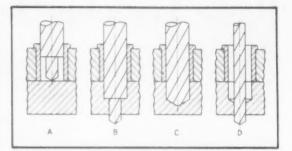


Fig. 19 (left). Standard commercial bushings are often relieved as shown here. Fig. 20 (center). If the end section of the step drill is of considerable length, there may be some difficulty experienced if the drill hits some surface irregularity. Fig. 21 (right). This is an example of a step drill adaptation. Also shown is the same jig, performing the same operation, using two sizes of ordinary drills.

tion with secondary operations because the step drill is a basic method of performing secondary operations. If a step drill is to be used in a jig, it often necessitates certain features to be designed and built into the jig in order to make the step drill operation possible. Hence, the designer must make up his mind before constructing a jig as to whether or not a step drill is to be used.

Jig Provisions for Using Step Drills. Since the step drill is a tool designed to fit the job, its length and diameter dimensions will be determined by the work to be done. For example, if the work required is as shown in Fig. 16, the step drill will necessarily be the counter-part. The point of importance is that the length at the "end" section is directly determined by the work required.

It will probably best explain the mentioned jig requirements to show what would happen if the above step drill were used in a jig not designed for step drill operation. This is shown in Fig. 17.

In this case the tip of the drill meets the work before the fixed bushing contacts the larger diameter of the step drill. The tip of the drill would move down into the work until the "step" met the top of the bushing. Not being central in the bushing, the step would be unable to enter. The point having entered the work, it would be unable to shift. The result would, of course, be inaccuracy (no guiding) and drill breakage.

Shown in Fig. 18 are examples of how the jig could be designed to make this step drill operation possible.

In each of these cases the distance from the face of the work to the top of the fixed bushing is greater than the length of the end section of the drill; consequently, the bushing contacts the "step" of the drill before the drill tip meets the work. In Fig. 18 this is accomplished in one example by leaving a clearance between the bottom of the bushing and the work, and in the other example by using a longer bushing.

When using long (standard commercial) bushings, remember that these bushings are often relieved. A bushing of this type is shown in Fig. 19. The relief is provided so that there will not be too

much contact surface between drill and bushing, since this would result in excessive friction and overheating.

Also shown in Fig. 19 is the effect of this relief when using a step drill. The tip of the drill will meet the work before any guiding action begins. Situations of this type may not come to light until after the jig has been completed, and the drill breakage commences. The relief on the bushings is inside and not immediately apparent unless the bushing is held up to the light and examined internally.

Length Limitations of Step Drill Operations.

If the end section of the step drill, Fig. 20, is of considerable length, this method of operation may prove impractical, due to the fact that the guiding is too far from the drilling. If the tip of the drill encounters some surface irregularity, it may bend slightly, and start off on a slight angle. As the drill continues to descend, binding or breakage may then result. Thus the step drill method has a limitation directly related to work requirement.

It was previously explained that unless certain design features are incorporated into a drill jig, it may be impractical or impossible to use this jig for step drill operations. In most cases however ordinary drills may readily be used in a jig designed for step drill operation.

Figure 21 shows an example of a step drill adaptation. Also shown in Fig. 21 is the same jig, performing the same operation, using two sizes of ordinary drills. The larger drill is used first; the V left by this drill is then used to center the second.

When in doubt as to whether or not to use step drills, circumstances permitting, it may be wise to design the jig for step drill adaptation, even though ordinary drills are to be used. Thus, if at some future date it becomes desirable to change to step drills because of increased shop lots, all that need be done is to obtain the step drills.

The difference between a step drill jig and an ordinary drill jig is only a minor point of spacing. The above policy should, therefore, not be expected to increase the jig cost.

Basic Forming Techniques for the Copper Base Alloys

By Lester F. Spencer

CHIEF METALLURGIST LANDERS, FRARY AND CLARK

Part II

THE PHENOMENON known as stress cracking may occur either during fabrication, during storage of semi-finished parts or components ready for assembly, or even after the article has been fully completed and on the market in the hands of the consumer. Stress cracking may be caused by any one of the following conditions: (a) The cracking of the part may be due to the magnitude of the stress concentration in a specific area causing failure in that area. (b) The failure of the item may be due to a combination of circumstances involving both stress concentrations and contamination of atmosphere; in this case, the stress concentration within the area of failure is often of considerable less magnitude than that in (a) and due to the presence of the contaminant, it is often referred to as 'stress corrosion cracking'. (c) Failure may be attributed to full immersion of the part directly in an annealing heat within a furnace, resulting both in a non-uniform and rapid liberation of stress; this type of failure is often referred to as 'fire cracking'.

In a drawing sequence, the percentage reduction on both the outside diameter and the wall thickness of each operation should be carefully calculated so that (a) maximum reduction per operation is realized, and (b) so as to prevent introduction of dangerous internal stress concentrations, especially in the finished shell, which may lead to failure either in storage or in service use.

In stress corrosion cracking, a phenomenon characteristic not only of the copper base alloys, the conditions which may lead to failure may be summarized, thus: (a) The existence of high tensile stresses either within the alloy as a result of cold working operations, or external tensile stresses such as would occur in tightly screwed bolts and hanger rods. (b) The presence of a corroding medium such as moist ammonia, ammonium compounds, or mercury and mercury compounds, even traces so slight that it cannot be detected by smell. (c) The element of time.

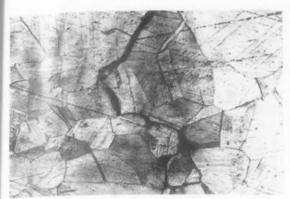
If any of the above factors are removed, the

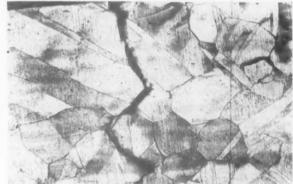
danger of stress corrosion cracking is reduced. The degree of susceptibility toward stress corrosion cracking will also be dependent upon the specific alloy composition. Thus, pure copper and the high copper alloys such as the copper-tin, certain coppersilicon alloys and the copper-nickel alloys are the more resistant. Brasses of relatively low copper content and high zinc such as vellow brass are the most susceptible. One method employed to prevent stress cracking is to provide a relief annealing treatment directly after cold working, whether it be on the completed fabricated part or parts that are semiprocessed and are placed in storage between interstage operations. Both the time and temperature of the relief anneal would depend upon such factors as the severity of the deformation, the probable distribution of stress concentrations within the item, the degree of softening that can be permitted, the anticipated service of the article, and the composition of the alloy.

Suggested temperatures which can be employed for relief annealing are as follows: for copper, a temperature range of 250 to 350 deg F can be employed; the 90/10 brass composition would have a range of 350 to 450 deg F; both the 80/20 and the 70/30 brasses would have a range of 450 to 550 deg F; the 60/40 brass composition along with the copper-tin alloys of the 95/5 and 90/10 compositions would have a range of from 325 to 425 deg F; and the nickel-silvers of the 64/18/18 variety would have a range of 425 to 525 deg F.

Where items are to be stored between stages of processing, another method can be employed to prevent this type of stress cracking, but it is a less positive solution to this problem. Shells may be stored in a dry place where the atmosphere is free from contaminants such as that mentioned previously. Where stress corrosion cracking occurs, it usually is inter-crystalline such as is illustrated.

The mercurous-nitrate test as outlined in ASTM specification B154-45 is a simple and reliable test to determine whether stresses exist in cold worked brass of a magnitude likely to cause cracking after





Figs. 6 and 7. Typical photomicrographs of materials that have failed, indicating an intercrystalline failure common with over-stressed areas.

a period of time. The part is cleaned by a brief acid dip and then immersed in a solution containing mercurous nitrate; cracks will appear in the article very similar in appearance to those caused by a normal stress corrosion failure. The period of time is dependent upon the severity of the residual internal stresses existing in the metal. The testing solution contains 100 grams of mercurous nitrate and 13 ml of nitric acid per liter of solution and the time period of immersion is usually 15 minutes. If no cracking occurs, it is assumed that no severe internal stresses are present, but any time less than 15 minutes would be considered 'high stresses' and possibly failure in service.

Fire cracking is attributed to the rapid and unequal relief of stress concentrations within the part. In many instances where stress cracking of this nature occurs, the shape of the part contributes to a large extent to this phenomenon. In a spun part where there is an extreme unequal stress concentration and distribution within the part itself. cracking has occurred in that area where the reduction is the greatest and, therefore, high stress concentrations are present as compared to the surrounding areas. Fire cracking can also occur on straight sided shells as shown. In any event, prevention of fire cracking can be realized by the use of a pre-heat treatment prior to direct immersion in the furnace at the annealing heat. This should be a standard practice on spun parts which are to be fully annealed for further cold working.

Forming Operations

To simplify a discussion of the various cold working operations that are performed on the copper base alloys, it is desirable to group these operations as to the specific method of forming employed and a basic discussion of each group can then be made. Thus, all operations may be loosely identified with any one of the following groups.

Group 1 — Those operations where a shearing action takes place such as in blanking, punching, perforating, compound blanking, trimming, etc.

Group 2 — Those operations where a bending action takes place exemplified by curling, expanding, beading and bulging.

Group 3 — Those operations where a drawing action takes place which causes the metal to flow plastically from one form to another under tensile loadings.

Group 4 — Those operations where a squeezing action takes place involving in most instances compressive strains. This group would include operations such as coining, swaging, sizing and cold heading.

Group 1 — Blanking is an operation involving a shearing action which is accomplished by means of a die and punch with sufficient clearances in proportion to the gage thickness, the temper and composition of the alloy. It is an excellent method of obtaining identical flat pieces and it is in this operation where economy of a sheet metal part can be exercised in both the development of the blank, the layout for maximum yield, and cutting of the blank. Thus, the layout of the blank may indicate that progressive blanking methods can be used where multiple blanks can be obtained in a single punching.

In blanking, the die is usually in a fixed horizontal position with the punch moving to obtain the shearing action required for blanking. Automatic gages are usually provided to regulate the forward movement of the strip or sheet between the successive strokes of the punch and guides are employed to provide alignment. Stripper plates may also be employed to strip the skeleton from the punch. In order to minimize distortion of the blank, the punch is ground flat and any shear angle that is required is ground on the surface of the die; this shearing angle is usually equal to the thickness of the material blanked.

The punching operation also involves a shearing action and should not be confused with blanking, since the product of the latter operation is a flat sheet which is subsequently formed, bent or drawn. Since the punching operation involves the making

of holes or irregular openings in flat products where the metal punched out is usually considered scrap, the shear angle required is placed on the punch rather than on the die component. This practice will prevent distortion within the flat sheet. Usually, the minimum diameter of the punched hole would be approximately equal to the thickness of the sheet; any hole smaller than that specified as the minimum should be drilled. The use of stepped punches are also recommended, especially where the holes may be closely grouped together.

Perforating is the punching of many identical holes in the sheet, blank or previously formed article by a single punch or multiple punch method. The clearance between the punch and die will vary in accordance with the conditions given; thus, a greater clearance is required by the non-leaded alloys than those compositions that contain lead, and a greater clearance is required for material that is in the 'annealed' condition than that which has been given an increased hardness through cold working. The clearance between the punch and

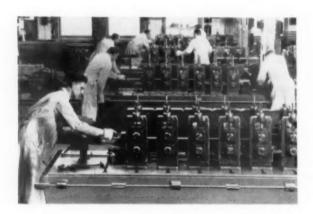


Fig. 8. A battery of cold forming machines for working copper alloys.

the die should be about one-tenth of the thickness of 'annealed' material. This value varies to approximately one-eighth of the thickness of cold worked material. This clearance may also go as high as one-quarter of the thickness of the material where perforating operations are performed with fine diameter punches.

A number of factors which influence the maximum pressure required for blanking include the specific alloy composition, the thickness and temper of the rolled material, the mechanical properties of the sheet or strip, the size and shape of the blank, and the sharpness of the cutting tools. Under the same conditions of thickness, temper, and tool condition, both yellow and cartridge brass have greater resistance to shearing than either low brass, red brass or commercial bronze. Copper has still lower resistance to shearing than this latter group of alloys mentioned. In the calculation of power

required to blank, punch or perforate, the shearing strength of the alloy composition is approximately 60 to 75 percent of the tensile strength.

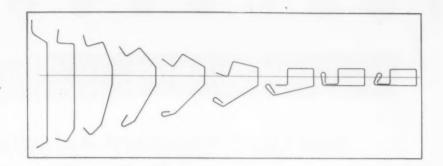
Group 2—All operations within this group involve plastic deformation, exceeding the elastic limit but not the ultimate strength. Metal movement is greater than that experienced in those operations classified under Group 1, but not as severe as that exemplified by the operations in both Groups 3 and 4. Thus, operations such as bending, bulging, beading, necking, flanging, curling and even shallow drawing or stamping operations are conveniently classified within this group.

Bending operations, where tensile and compressive strains are involved within the same part are used extensively, especially in production of springs, clips and similar items from spring temper material. The minimum bend radii to be employed in a design will vary in accordance with such factors as the composition of the alloy, both the thickness and temper of the material to be bent, the direction and the length of bend, and the edge condition of the blank.

Annealed material will permit more severe bending operations than that which has been cold worked to a temper. Where materials are capable of being heat treated to a desired hardness, severe forming operations are usually done with the material in the annealed state. The exception to this is beryllium copper where it is often more desirable to work the metal which has been partially cold-worked, since this will ultimately improve the spring characteristics of the part after final heat treatment. On annealed material, bend radii will vary from one-half the thickness of the stock to a sharp bend. The bend radii is dependent upon the thickness of the stock. As the material is progressively cold-worked to the higher tempers, the bend radii will be increased from one-half to one and one-half the thickness of the stock.

In general, the thinner the gage, smaller amounts of cold work and larger bend radii will permit a larger angle of bend. Allowances for spring-back must be made by an amount in direct proportion to the temper of the material. This is usually done by over-bending an amount equal to the anticipated spring-back of the material. The value of this elastic distortion is largely determined by experience and in other instances by a trial and error method. The location of the bend is particularly important in the cold rolled tempers since least ductility is obtained when the strip stock is stressed parallel to the rolling direction. Thus, it is often necessary to arrange the strip for blanking so that no severe bending is made in that direction. This frequently results in cutting the part at an angle of 45 deg or in a direction transverse to the direction of rolling.

Fig. 9. This diagram illustrates the operational sequence in cold forming.



The power brake, the single-action press, and both draw- and roll-forming techniques are widely used. The power brake is particularly versatile in such operations as bending, flanging, curling, beading, flattening, seaming and similar operations, which are performed with suitable die components and where either straight sections or straight flanged parts are produced in limited quantity. Drawbench forming is used quite extensively in the brass and copper industry in reducing tubing from the pierced or extruded form to its finished dimensions, especially in the smaller diameters beyond the minimum of that specified for either extrusions or pierced tubing.

In cold roll forming, a flat strip of metal is passed through a series of rolls arranged in tandem and is progressively formed into the ultimate desired shape. As in drawbench forming, the process can be geared for high production requirements and is versatile in that innumberable shapes can be made. Usually, where this process of forming is done, stock material of a standard width is purchased and subsequently slit to the required width of the part to be formed. A typical example of a rolled formed section is illustrated.

Flanging is an operation that consists of turning out the open end or edges of a hollow article made of sheet metal in cylindrical, rectangular or other forms. It is very similar to that of beading and uses similar equipment. Beading consists of producing strengthening ribs or beads around hollow shapes usually cylindrical in shape. This operation being performed in several ways. The simplest method consists in rolling a bead on suitable equipment such as a formed arbor and shaped roll placed parallel to each other with the arbor usually a rotating fixed member while the rotating roll is ordinarily operated by a cam that moves it into position toward the object. Beading is accomplished by squeezing the item between the roll and the arbor. A less common and more complicated method uses segmented dies. A shallow head is frequently formed on a drawn shell or lube by use of a punch and die where the portion of the body beneath the bead is held closely in a confined die, while a shouldered punch applies pressure at the open end.

The bulging operation is performed on many

items and consists of expanding or enlarging the center portion of a straight-sided shell. Mechanical bulging methods use either a segmented die or a rubber punch. In the former method, the metal segments are held together by springs around both the top and bottom ends, the compressive action of the springs causing the segments to move out and form the bulge. A difficulty associated with this method of bulging is that there may be slight flats on the surface of the bulged item which may be objectionable to the appearance of the item. Rubber punches, although eliminating these flat areas, have but limited life and must be replaced frequently to obtain satisfactory shells. Hydraulic bulging can sometimes be employed, especially where intricate shapes are involved. With this method, however, factors such as proper pressure and volume of fluid, proper venting and the prevention of leakage may prove discouraging.

Necking as applied in working copper base alloys is a combination of mechanical operations involving tapering, swaging or reducing the circumference of drawn shells, and may be accomplished on various kinds of equipment. Tubes are tapered in rotary swaging machines, the tops of drawn shells and caps can be reduced in diameter by means of re-draw dies, and a necking operation for an item such as a water pitcher can be reduced on a spinning lathe. The operation may be quite severe and it is usually necessary to provide an annealed material to obtain maximum ductility. Otherwise, failure may occur. Depending upon the severity of the operation, it may be necessary to break down the necking operation into several gradual reductions with intermediate anneals to keep the material workable.

Both curling and wiring stresses the material both in tension and in compression, but it is seldom severe enough to cause the material to crack. The purpose of this operation may be either to protect a raw edge, re-inforce an edge, produce a hinge on a handle, or to join two pieces of metal together as in double-seaming. When a wire of correct diameter is laid on the die so that the metal curle around it and covers it completely, the operation is known as wiring.

(Continued next month)

U U U U U U U U U

American Standard Tolerances for Ball and Roller Bearings

(Continued)

Table 6—ABEC-3 Magneto-Type Ball Bearings. Tolerances in 0.0001 Inch.

Inner Ring

B		lerances	Bore To		Bore				
			ge d _m	Avera	es*	Inche	n	Mr	
R	d max	d min	high	low	Incl	Over	Incl	Over	
	+1	-3	+0	-2	0.3543	0	9	0	
	+1	-3	+0	-2	0.7087	0.3543	18	9	
	+1	-3	+0	-2	1.1811	0.7087	30	18	

Outer Ring

Outside Diameter					iameter Outside Diameter Tolerances					
Mı	n	Inch	es*	Avera	ge D _m			- (Total		
Over	Incl	Over	Incl	high	low	D max	D min	Reading		
0	18	0	0.7087	+3	-0	+4	-1	4		
18	30	0.7087	1.1811	+3	-0	+4	-1	4		
30	50	1.1811	1.9685	+3	-0	+5	-2	4		
50	80	1.9685	3.1496	+4	-0	+6	-2	5		

^{*}Inch equivalents added for reference only.

Width (All Sizes)

	Tole	rance
	High	Low
Individual rings	+ 0	- 50
Assembled bearings	+50	- 50
Pair of inner or outer rings duplexed†	+ 0	-200

[†]If other than a pair of bearings is involved, the tolerance is in proportion to the number of bearings.

TOOL ENGINEERING DATA

NUMBER SIXTY-ONE

American Standard Tolerances for Ball and Roller Bearings

(Continued)

Table 7—ABEC-5 Magneto-Type Ball Bearings. Tolerances in 0.0001 Inch.

Inner Ring

		Bore		Bore Tolerances		Radial Runout (Total	Parallel-	Side	Groove Parallel-
Mi	m	Inch	ies*			Indicator	ism of Sides	Runout	ism with
Over	Incl	Over	Incl	d min	d max	Reading)			Sides
0	9	0	0.3543	-2	+0	2	2	3	3
9	18	0.3543	0.7087	-2	+0	2	2	3	3
18	30	0.7087	1.1811	-2	+0	2	2	3	3

Outer Ring

		Bore		Outside Diameter Tolerances		Parallel- ism of	Side	Groove Parallel- ism with	
M	m	Inch	ies*			(Total Indicator	Sides	Runout	Sides
0ver	Incl	Over	Incl	D max	D min	Reading)			
0	18	0	0.7087	+2	-0	2	2	3	3
18	30	0.7087	1.1811	+2	-0	2	2	3	3
30	50	1.1811	1.9685	+2	-0	2	2	3	3
50	80	1.9685	3.1496	+3	-0	3	2	3	4

Inch equivalents added for reference only.

Width (All Sizes)

	Tole	rance
	High	Low
Individual rings	+ 0	- 50
Assembled bearings	+50	- 50
Pair of inner or outer rings duplexed†	+ 0	-200

†If other than a pair of bearings is involved, the tolerance is in proportion to the number of bearings.

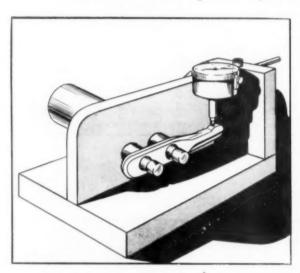
Gadgets

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Special Gage

The problem was to design a gage to check two broached holes in a forged lever against a coined pad on the end. Since the part was difficult to hold and locate, frequent checking of the hole locations was required. The holes were broached to 0.4438 to 0.4448 in.

Designing a two-pin gage to take full advantage of the center distance tolerance, 0.003 in. in this case, usually involves making one pin oval. This is all right unless, as here, the oval pin has to be a locator too. To eliminate the undesirable aspects of this type of pin, the gage was designed as shown in the sketch. One pin is ground on a taper from 0.4438 in. to 0.4448 in. and is set permanently into

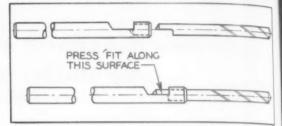


a vertical plate. The other pin is similar on the gaging end, but is finished into a knurled handle on the other end. A square piece of steel is attached to the shank with a smooth slide fit. This square is confined in a space 0.006 in. longer than the width. This allows 0.006 in. travel laterally for the handled member, which is free to slide back and forth about ¾ in. It is kept from further movement by a screw through a slot. In use, the finished workpiece is put on the stationary gage member, and the moveable member is slid backward or forward and then inserted through the hole in the workpiece. After seating the moveable member, variation from the established limits is read on a dial indicator.

Full seating, which is imperative, is made possible in this gage since the ratio between hole distance and hole to pad is about 1:5. Therefore, a variation on seating the work of 0.0005 in, is multiplied to 0.0025 in, on the pad.

Frank M. Butrick, Jr. Alma, Mich.

Drill Extension Adapter



Instead of sweating or brazing the drill into the extension as was done formerly, by using a press fit as shown in the sketch, the drill can be easily inserted or removed with only a light tap on either end, and without removing the drill from the drill chuck.

Fred Barker Ilion, N. Y.

Welder Curtain

Fire-resistant curtains used to stop flying sparkfrom welding machines also cut off the air from the operator. As shown in the illustration, a metal-



slat venetian blind will serve the same purpose and at the same time permit air to circulate freely. In this particular installation, the shade is hung from the exhaust metal to shield a welder standing on the floor. For use with bench welders, the blind can be mounted on wooden supports and placed between operators.

> E. Guilbert Chicago. Ill.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of \$5.00 for each item.

Electronic Controls—

Machine Tool Applications

By Robert T. Kimmel

HE FIELD of electronics is a relaively new one when compared to netalworking, and its impact on ther industries is only in the procss of developing. It is only in reent years that electronic controls ave been applied to machine tools. At the present time, electronic equipment is supplied as standard n only a few machines, and most of the installations where this method f control is used have been custom built for some special purpose. However, there is a great deal of research nd development work now being onducted by the machine tool buildrs, the machine tool users and the ectronics manufacturers.

ork

Electronic controls used in conjunction with machine tools may serve one or all of several purposes. Primarily they have so far been used as the means of obtaining a variable spred adjustable drive and feed control. They are also employed for

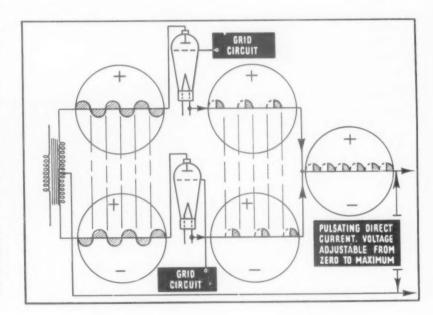
Fig. 1. Two half wave rectifiers are shown here connected for full wave operation. The grid control is set so that the tube starts to conduct current at the midpoint of the half cycle. This firing point can be set at any point on the half cycle.

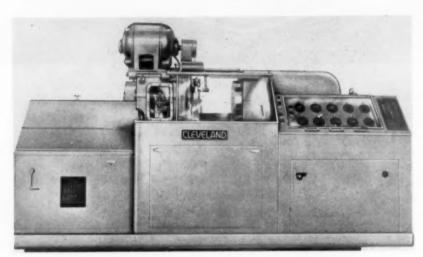
automatic machining of a given profile or contour and as relays, timers and switches.

Electronic Motor Control Drive

A variable speed adjustable drive is highly desirable on many machine

tools, especially those for milling, boring and grinding. It is also desirable to be able to change the speed without stopping the machine and to maintain a constant speed under variable load conditions. The d-c shunt wound motor is widely accepted as a drive for machine tools





because of its large speed range as well as its desirable speed-torque characteristics. An electronic motor control makes it possible to use this type of motor by rectifying the ordinary a-c power supply to direct current.

The electronic motor control drive usually consists of four elements: an a-c transformer which has the correct number of phase windings and correct secondary voltage for supplying the rectifier tubes; the electronic cabinet proper which contains the necessary tubes, resistors, relays, capacitors and related equipment; the operator's control station with pushbuttons and speed adjusting dials; the d-c shunt wound motor itself.

The thyratrons in the control cabinet are the electronic devices which convert the primary a-c source of power into direct current which is supplied to the drive motor. Without going into a detailed analysis of the operation of electronic tubes, it is possible to say that this is accomplished by controlling the voltage on the grid which separates the anode from the cathode in the tube. A change of one or two volts on the

Fig. 3. After spindle feeds and speeds for each of the five stations have been determined, a chart shown at the right of the control panel here transposes these feeds into dial settings. By merely turning the pointer to the desired dial setting, the feed rate is set, and this can be changed while the tool is cutting.

grid may change the anode current from full on to full off. Since there is no current flow in the grid, its power requirements are very low. Hence, a very minute amount of power applied on the grid will control relatively large amounts of power through the anode circuit.

Controlled rectification of the a-c power is possible because of the ability to select the point at which the tube will start to conduct. Shown in Fig. 1 are two half-wave rectifiers connected for full-wave operation.

By advancing or delaying the point on the a-c voltage wave at which the rectifier tubes fire, or begin to conduct, only a part of each a-c voltage wave is rectified, thus Fig. 2. This single-spindle automatic screw machine, made by the Cleveland Automatic Machine Co., incorporates the basic principles of universal camming and simplicity of operation, yet has a wide range of versatility.

controlling the amount of dec power In actual practice this is usually a complished by applying to the th ratron grid an a-c voltage from small grid transformer. This voltage through the proper adjustment capacitors and resistors in the gr transformer secondary circuit. the anode or line voltage by 90 grees. In addition, a variable nega tive d-c voltage is applied to t same grid. When the d-c voltage component is zero, the maxim advance in firing angle is obtained and the maximum voltage is appl to the motor. When the d-c co ponent is increased negatively, t firing angle is delayed until the voltage applied to the motor is reduced to zero.

There are two methods for varying the speed of a d-c shunt wound motor. These are by varying the current supplied to the armature of to the field. The actual mechanism by which the voltage to the motor is controlled is a potentiometer, on when both methods are incorporated two ganged potentiometers are used usually mounted in the pushbuttor station. One controls the armature voltage and the other the field voltage. By special construction of these



Tool Engineering Report

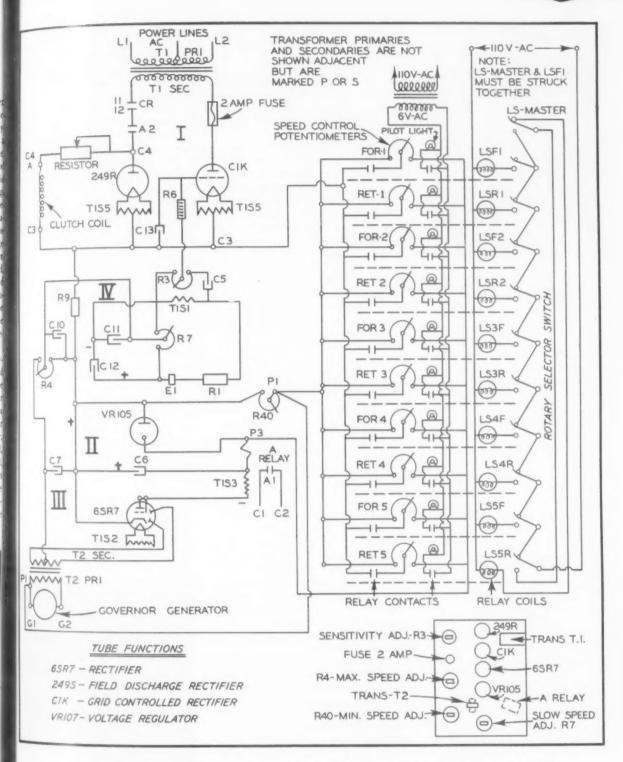


Fig. 4. Schematic diagram of the electronic control circuit of the Cleveland single-spindle automatic screw machine. The power output rectifier circuit is shown at I, the reference voltage power supply at II, the generator rectifier circuit at III, and the phase shifting system at IV.

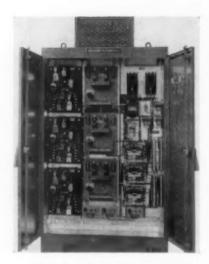


Fig. 5. This is the control c cabinet for a special Gisholt machine for performing the clutch facing operation on automobile flywheels.

potentiometers, the field voltage is kept constant at low speeds, and the motor speed is controlled by changing the armature voltage up to the basic speed of the machine. Above the basic speed, the armature voltage remains constant and the field voltage is varied downward. At basic speed, there is full voltage on both the armature and the field.

When armature control is used, the practical ratio of speed variation is about 20 or 25:1. The torque is constant, making the horsepower directly proportional to the speed.

If field control is employed, a speed range of 3:1 or possibly 4:1 can be obtained above the motor's base speed. In this instance, the horsepower is constant and the torque decreases as the speed increases. Thus it can be seen that a ratio of speed change as high as 100:1 is possible.

Application of Electronic Drive Controls

A careful analysis must be made in each case where an electronic motor control drive is to be applied to a machine tool since the characteristics outlined above must match those required by the machine. The type of work to be done will dictate the operating characteristics which in turn govern the choice of drive.

For example, consider a lathe tooled to perform a facing operation. The machine is equipped with an adjustable-speed drive arranged so that the spindle speed is automatically adjusted during the cut to maintain constant surface speed at the tool. Assuming that the depth of cut and the material are both uniform, the power required to remove the metal is constant because the torque decreases and the speed increases at the same rate as the tool feeds from the outside to the inside diameter of the cut. The torque required to drive the spindle when no cut is being made is constant, and the horsepower required will then be a direct function of the speed. Hence the total power that must be furnished by the adjustable speed drive is made up of two components: a constant torque portion to overcome machine friction and a constant horsepower component for supplying the power required at the tool.

It is obvious that, if a finishing cut of a few thousandths is being made, the constant horsepower component of the total load on the drive may be very small. The proper drive under this condition would be one with armature control, and the size of the drive would be determined by the torque required at the low end of the speed range. The opposite condition holds true when heavy roughing cuts are being made. The constant horsepower component may then be limited only by the capacity of the machine, and the power required to overcome the machine friction will be only a small fraction of the total power to be furnished by the drive. For this condition, the proper drive is one using field control that has a constant horsepower characteristic. In this case, the horsepower required at the high end of the speed range will determine the size of the drive.

The choice of the proper drive for this machine, therefore, will depend upon the work to be done.

When compared to other methods of speed control, some of the more apparent advantages of the electronic motor control are: an infinite number of speeds within the range of the drive motor instead of certain pre-determined number limited by the gear changes supplied; speed changes can be made at any time by the operator without stopping the machine, which makes for ease of operation and facilitates adjustments as the cutting tool requires; automatic sequences of operations can be set up which require frequent changes in feed speed as the sequence of operations changes.

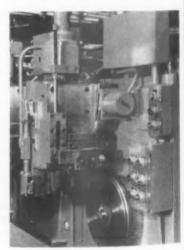
The speed control or potentiometers employed are small and compact and can be located in a pushbutton station along with the start and stop controls. This is in contrast to the large rheostats required for motor-generator sets.

Operating Features

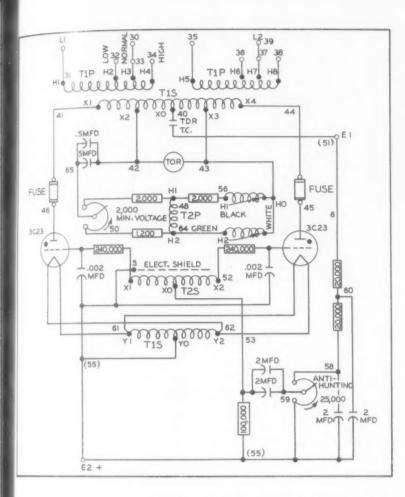
Starting. The motor is always started with full field regardless of the setting of the speed-control potentiometer. If the desired speed is above the base speed, that portion of the control that weakens the field will not become operative until the motor reaches base speed.

Dynamic Braking. By inserting a dynamic braking resistor across the

Fig. 6. A close-up view of one of the stations on the Gisholt special machine which performs the clutch facing operation on automobile flywheels. The units are controlled by short stroke dancer rolls.



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armature, the motor can be stopped quickly.

Manual Speed Adjustment. A small potentiometer, usually mounted in the pushbutton control station, provides a means of changing the speed of the motor at any given time, or it can be preset for any desired speed. The potentiometer alters the negative d-c component to the rectifier tube and regulates the amount of rectified d-c power supplied to the motor armature and/or field from maximum to cut-off.

Automatic Speed Regulation. The electronic motor control drive, with the addition of a few components, can supply automatic speed regulation, either mechanically or electrically. These devices, when added to the primary circuit, make it possible to set up a sequence of operations, such as that used on a turret lathe, during which the feed speed

will automatically change as the sequence of operations demands. In addition, the correct value of output voltage is supplied to the motor to maintain preset speeds under conditions of varying loads.

Reversing and Inching. Contactors and relays can be added to the equipment to provide for reversing and inching forward and in reverse.

Overloads. Adjustments are provided to limit the amount of current the motor will take. This value is usually set at between 100 and 200 percent of full load. In the event of stalling, the motor will draw only this predetermined amount of current, and if the stalling is prolonged, relays are usually provided to take the motor off the line.

A single-spindle automatic screw machine made by the Cleveland Automatic Machine Co. is shown in Fig. 2. The machine turret operates

Fig. 7. This schematic wiring diagram shows the variable reactor, the phase shift circuit, the rectifier system and an anti-hunt device used in the short stroke dancer roll control.

in five positions and the turret feeds are electronically controlled from the panel shown in Fig. 3. No cam changes are necessary to adjust the feeds of the turret tools. The turret drive provides infinitely adjustable feeds which can be pre-selected for each of the five positions. After the spindle speeds and feeds for each position have been determined, a chart on the control panel transposes these feeds into dial settings. By turning the dial to the desired dial setting the feed rate is set, and this can be changed while the tool is cutting.

The electronic control circuit is shown broken down into its individual circuits in Fig. 4. The schematic diagram is divided into the power output rectifier system (I), the reference voltage power supply (II), the generator rectifier circuit (III), and the phase shifting system (IV).

The free wheeling rectifier system (I) shows a condition of positive plate voltage on the grid controlled rectifier tube CIK, which is conducting at this time, causing 275 volts peak rectified voltage to be applied to the coupling load at this moment. During the time that the CIK tube is negative, it no longer conducts, but the energy stored in the coupling load is then dissipated with an inverse polarity through the tube 249R.

The reference voltage supply consists of a half-wave rectifier, filter and voltage control system (II). One hundred fifty volts a-c is applied to the plate of tube 6SR7. This tube acts as an ordinary rectifier, since the grid is tied to the plate, this voltage being filtered by the condenser C, and controlled by the voltage regulator VR-105. The speed control. W-40, is connected in series with dialed rheostats.

The generator rectifier circuit (III) consists of a small three-toone transformer increasing the voltage generated by the governor generator by three times. The voltage

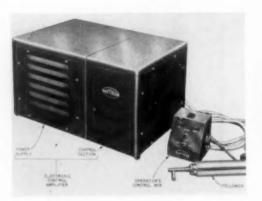


Fig. 8. Called a single motion duplicator, this machine can produce hundreds of parts which are the exact duplicate of a master. An electronic finger feels the contours of the master and directs the cutting tool accordingly.

from this transformer is rectified by the two diode plates on the tube 6SR7, this voltage being filtered by a 0.25 mfd condenser, C7. This voltage is divided by a potentiometer, W4, which is known as the maximum speed adjustment.

In the phase shifting network (IV), 50 volts a-c is applied to a resistor, W-3, and condenser in series, thereby causing a voltage to be produced on the resistor, which is approximately 90 degrees out of phase with the transformer winding. The resistance is adjustable so that this voltage can control the sensitivity of the entire system. It is known as the sensitivity control and is used to smooth out any erratic firing of the CIK rectifier.

An electronic control of a different type is used on a Gisholt special three-station machine designed expressly for the clutch facing operation on automobile flywheels. The drive requirements included a specification that spindle speeds from 125 to 375 rpm be provided automatically throughout the machining cycle. This is to permit maintaining a constant speed in surface feet per minute with a margin of plus or minus five percent over the entire face of the flywheel. Fig. 5 shows the control cabinet for the machine where the correlation of the a-c. d-c and electronic controls for the machine can be seen. A close-up view of one of the stations of the machine is shown in Fig. 6.

Electronic excitation of the spindle drive motor fields by the use of Reliance VSS control units was decided upon as a satisfactory solution. These units are controlled by short stroke dancer rolls, the strokes of which are controlled by simple cams carried by the tool slides. A schematic diagram of the short stroke dancer roll control with anti-hunt circuit is shown in Fig. 7.

The short stroke dancer roll is a phase shift rectifier device which produces a variable rectified d-c output voltage. The variation in the voltage is produced by displacing an iron core in a solenoid or wound coil. The mechanism is composed of a variable reactor, a phase shift circuit and a rectifier. The reactor is mounted on a base. The plunger shaft is moved by a cam on the tool slides to obtain full travel for full control.

The rectifier is a conventional single-phase full wave unit using a 500-watt exciter transformer and two 1.5 ampere 3C23 thyratrons. The unit is capable of exciting a two-ampere motor or generator field. The usual line voltage correcting tap switch and 30-second time delay relay are incorporated. The rectifier is controlled by the reactor and the phase shift circuit.

When the total motion at the point of control is less than about six inches or when the speed range of the unit is more than 2:1, a suitable anti-hunting means should be added to the basic controller. This is shown in the diagram at the lower right in Fig. 7. The anti-hunting control measures the rate of change taking place in the output of the rectifier and delays this change in proportion to the rate at which the change is taking place. The basis of this circuit is, as in most anti-hunt circuits, mainly to provide a biasing

voltage whenever a change in output is taking place. The amount of this voltage should be proportional to the rate of change of output voltage.

Automatic Reproduction

Electronic controls on machine tools also provide for the automatic reproduction of a given profile or contour. Pratt & Whitney, aided by the General Electric Co., devised a means whereby a master turbine blade for a jet engine compressor for prototype testing can be made in three days for \$100. The former method took from four to six months and cost more than \$4000.

Using this method, a series of airfoil contours, derived from sections through the master blade, are drawn on white-coated sheets of steel. The number of sections required depends on the length and degree of twist of the blade. The drawing is magnetically mounted on a slide carried on a column and moved vertically by means of a leadscrew. A table in front of the column carries an electronic scanning device which is moved horizontally by a second leadscrew.

Motion of the vertical and horizontal leadscrews is applied to Selsyn units. Their motion is transmitted electrically to two Selsvi motors mounted on a standard Moore jig borer. Through gear boxes equipped with standard Boston gear trains, these Selsyns operate the jig borer's lead-screws to generate a contour proportionate to the drawing. Three pairs of change gears on each screw make it possible to obtain any desired reduction with close limits. The motions of the elec tronic scanner are thus transferred to a horizontal plane in the jig horer. The vertical position of the cutter is set by precision gage blocks. Finished blade masters made thus are accurate within one thousandth of an inch.

A second device shown in Fig. 8 developed by the Raytheon Mfg. Co., is called a single motion duplicator. By using an electronic "finger" which feels the contours of a master pattern, hundreds of parts, exact duplicates of the original, can be

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produced. It is used to turn shafts, bearings, pulley sheaves, mill rolls, printing machine rolls, commutator rings and similar parts of irregular contour. It has also been used in die sinking operations and in producing cams of complicated designs on milling machines.

day, 190

The duplicator consists of a follower, an electronic control unit and an output drive motor. The follower is a variable reluctance transducer whose electrical output varies in accordance with the contours of a templet. This signal is amplified and detected in the electronic control unit, providing the drive to the output motor. The motor, in turn, positions the follower and cutting tool.

Electronic Relays

Electronic tubes can be considered as special types of rheostats or switches, with the exception of special purpose tubes such as the X-ray tube or the cathode ray tubes. In many applications, tubes surpass the older devices when used as rheostats or switches. The two main advantages of tubes when used for these purposes are their ability to react to very small amounts of current and speed of operation.

Since there are no moving parts, frequency of operation is almost infinite.

An example of the uses of this type of fast-acting relay is its application to a machine manufactured by the Cincinnati Milling Machine Co. some time ago. It was desired to obtain a "pickfeed" at either or both ends of the stroke of a table. The table motion was hydraulic, as was the pickfeed function. Experiment showed that the table did not remain at the end of the stroke long enough to keep a limit switch closed long enough to pick up a standard type electrical relay. Investigation showed that the limit switch was closed approximately 0.004-0.005 seconds. When an electronic relay was applied and tested, the results were found to be satisfactory, since a signal of 0.004 seconds duration was sufficient to operate the relay consistently. This is possible because the grid circuit. shown in Fig. 9 is arranged with capacity that holds the grid negative (and makes the relay drop out) after the initiating signal disappears.

Headstock Positioning Stop. Certain types of work ground on grinding machines, such as crankpins or offset cams, must be loaded with the headstock chuck in a certain angular position, particularly where high production is required. In some cases, this means that the spindle must be stopped within a few degrees of a certain point. The problem is accentuated by the fact that the normal spindle rotation must be high in order to obtain proper grinding speeds.

Actually two requirements are necessary to obtain proper operation. First, a type of drive must be used that has provision for obtaining a slow speed on the spindle to obtain accurate stopping. Second, a "stop" signal must be obtained from the spindle itself when the spindle has reached the proper angular displacement from the stopping point. The amount of braking required will depend on how slowly the spindle can be run and the amount of stored energy or inertia in the headstock drive.

The low speed can be obtained in several ways, but usually it is electrical; for example a d-c motor with provision for momentarily reducing the armature voltage is satisfactory. The "stop" signal can also be obtained in several ways, but the advantages of an electronic relay make it the first choice here.

Fig. 9 (left). The grid circuit shown here is arranged with capacity that holds the grid negative (and makes the relay drop out) after the initiating signal disappears to operate the limit switch which remains closed only 0.004 seconds.

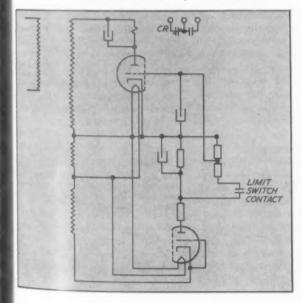
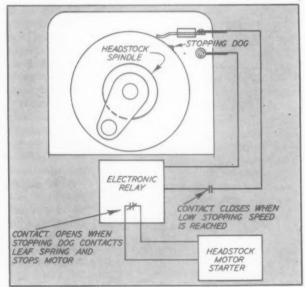
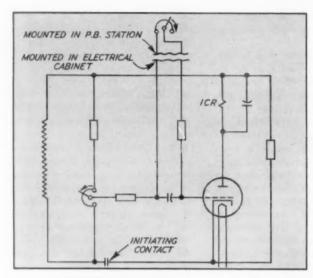


Fig. 10 (right). This is a schematic diagram of a system to be used to stop a headstock in a particular position as applied to a Cincinnati grinding machine.



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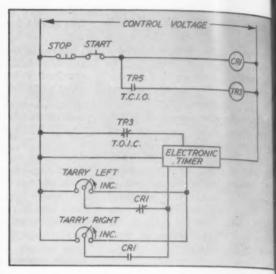


Fig. 11 (left). Using the circuit shown here, a machine operator can adjust the length of tarry time to suit his convenience. Fig. 12 (right). The electrical circuit shown here has been applied to a Cincinnati Milling Machine Co. precision grinder to obtain two independent time delays.

The system is diagrammed in Fig. 10 where it can be seen that the contact used will be subject to extremely hard service, since it must make contact each time the spindle rotates. In addition, one side of the contact is on the rotating spindle. the other on the solid portion of the headstock. Unless insulated brushes and slip rings are used, the oil film formed around the rotating spindle presents a high-resistance path and consequently prevents the use of a low-voltage sensitive relay. electronic relay, however, will operate when the resistance in the initiating circuit is very high (up to five megohms). Consequently, the oil film presents no problem, and insulation on more than one of the contacts can be eliminated. A lowcontact pressure is satisfactory and a very light leaf spring with long life can be used.

In addition, since the contact is working in the grid circuit of a tube, the contacts can be shorted out without damage to the relay. As can be seen from the diagram, one contact is grounded to the machine itself. If the operator should come in contact with the leaf spring, the power requirements are so low that he would not be able to detect the voltage.

The electronic relay can be

mounted on the panel along with the other controls, and unshielded leads run out to the contact on the headstock. The positioning stop circuit described here can be applied to any rotating member, such as a milling machine spindle.

Remote Adjustable Time Delay

Electronic time delay relays are relatively accurate, flexible, and reliable. In addition, they have the ability to control time from a push-button station without mounting the timer in the station. The potentiometer used for controlling the time delay is usually a two-watt unit which takes up no more room than a standard pushbutton unit. Consequently, the machine operator can adjust the time delay to suit his requirements without opening an electrical control panel.

An example of such a time delay relay is its use on a grinder. Accurate size is obtained by having the wheelhead come in against a positive stop and the grinding wheel tarry for a few seconds. The operator can adjust this length of tarry time to suit different sizes and types of work, as well as different grinding wheels. The circuit used is shown schematically in Fig. 11.

In addition, the electronic time

delay relay can be used in conjunction with two or more independent potentiometers, and by proper switching, independent time delay can be obtained from one unit. Its electrical circuit for such an arrangement as applied to a precision grinder is shown in Fig. 12.

Bibliography

"Electronics Applied to Machine Tools," B. T. Anderson, The Iost Engineer, Vol. XVI, No. 1
"Electronic Adjustable Speel Drives," G. A. Caldwell, The Iost Engineer, Vol. XIII, No. 5
"Electronic Drives and Control," Tool Engineers Handbook
"Electronic Devices as Components of Machine Tool Control," J. M. Morgan, Jr., Westinghouse Machine Tool Electrification Forum, 1950.
"Blade Process Speeds Jet Engine Development," Metalscorking, May, 1951.

Cover

This is an electronic control pand for a LeBlond lathe which perform one of the operations in the motor assembly line at the DeSoto engine plant in Detroit.

> Another Tool Engineering Report will appear in July issue, The Tool Engineer.



Dallas Host to Area Meeting

by Nancy L. Morgan

ASTE attention will be focused on Dallas, Texas when the South West Area meeting opens on May 30. Members from chapters in Houston, New Orleans, North Texas, Wichita, Kansas City, Denver, Tulsa, Los Alamos, Albuquerque and Salt Lake City will gather at the Baker Hotel for the two day meeting.

Highlights of the program will include plant tours, technical sessions, a membership meeting and an informal hanquet which will feature a 'headliner' speaker and entertainment.

V. V. Koodroff, general chairman and North Texas member, announced that the Murray Company of Texas, manufacturers of cotton gin machinery, and an aircraft firm in the Fort Worth-Dallas area have been selected for ASTE visitation.

A technical paper on "The Hi-Jet System for Increasing Tool Life" will be presented at the area meeting by W. E. Kramer, research engineer with the Gulf Research & Development Corp., Pittsburgh.

Mr. Kramer, a mechanical engineering graduate of Carnegie Institute of Technology, has worked for the past 15 years on industrial lubricant research for Gulf. He has spent considerable time of the design and development of machines for testing industrial lubricants. His address will be given May 31.

Principal speaker at the technical session on "Resistance Welding as a Production tool" will be William R. Plummer, general sales manager of Progressive Welder Co., Detroit.

The resistance welding field counted Mr. Plummer as one of its members as long as 16 years ago when he spent several years as a shop superintendent, building resistance welding equipment. Joining Progressive in 1945, in the planning department, he has served as chief estimator and chief sales engineer and took over his present sales position in 1948.

"Marform for Flexible Aircraft Pressworking" will be discussed in another session by Byron Nierenberg, sales engineer with Loewy-Hydropress, New York City.

An aeronautical engineering graduate, Mr. Nierenberg was stress analysist and engineering analysist for die forging and extrusion presses in the heavy press program of the air force, before becoming engaged in the sales of presses and other hydraulic equipment for the New York company. Featured on the technical program at the area meeting will be panel discussion on metal forming, moderated by John A. Lapham.

Although ASTE members in the Dallas area are handling business arrangements, all chapters participating in the area meeting are sharing in the sponsorship of the event.

Irving H. Buck is chairman of the banquet committee. Plant tours are under the leadership of J. E. Franklin and transportation is being arranged by Chuck Stevens.

Greg Contuci is in charge of tickets and reception details are being covered by Lee Shetler. Jack J. Vanderweel and M. W. Smeal are heading the greeting committee. Technical sessions are being handled by Fred Bates.

M. P. Flynn and A. E. Unruh are heading the committee for budget and reports. John Lapham and Bernard Greene are covering publicity activities.

Chairman of the committee on hotel reservations is P. D. Browne. In charge of signs and properties are E. L. Minch. Roy Jones and Wallace Enmen. Ladies' activities are being arranged by Mrs. Unruh and Mrs. J. K. Turvene.



Chairman Holly (center) receives charter from F. J. Schmitt, director-elect, and R. S. Waindle, first vice president

96th Charter Presented to ASTE Chapter In La Crosse, Wis.

Presentation of the La Crosse, Wisconsin, charter on April 1 marked the birth of Chapter 96 of the American Society of Tool Engineers. Roger F. Waindle, first vice president, and Fred J. Schmitt, director-elect of the Society, conducted the official ceremonies held at the Linker hotel.

Importance of the La Crosse chapter, the first technical society in the area for those individuals directly concerned with production problems, was emphasized by E. E. Hallander, who welcomed the guests.

Present for the meeting were Fred Kessenich, charter chairman of the Madison chapter; Deane Wolff and Walter Meinhardt of the Milwaukee chapter; William Funk, president of the La Crosse Trailer Corp.; and Clyde Searle of the Electric Auto-Lite Co.

Messages of congratulation from National Membership Chairman Andy Clark, and the Milwaukee and Racine ASTE chapters were read with the announcement of the gift ashtrays embossed with the ASTE emblem to the 64 charter members from the Milwaukee chapter.

Before presenting the charter to Chairman John Holly, Mr. Waindle spoke briefly on the growing importance of the broad field of tool engineering and the great role it is playing in today's economy.

Charter officers of the chapter were installed by Mr. Schmitt. In addition to Mr. Holly in the chairman's post, they are: Harold Philpot, first vice chairman; Ed Duffy, second vice chairman; J. I. McCauley, secretary and Wesley Bertelson, treasurer.

The appointment of committee chairmen and plant representatives in the new organization was announced. Mart Dosing will serve as program chairman; Don Smith, membership; Helmer Johnson, constitution and by-laws, Ed Giroux, public relations, and Frank Chopieska, standards.

Recognition was made of the efforts of the original organizing group, Jack Andresen, Robert Luxford, Mr. Giroux and Mr. Holly.

Acceptance and backing by La Crosse industry is well illustrated by the support of the Trane Co., Northern Engraving Co. and the La Crosse Trailer Corp. as affiliate members.

Charter members are: H. Walters, H. C. Philpot, J. Pflugradt, H. Facius, Fred V. Horak, R. S. Reaves and Maynard Wahlberg, Allis-Chalmers Mfg. Co.; E.

Giroux, John Holly, Clyde Bounds, Norman Jacobson, Robert Phillips, John Rooney, William Nichols, Mart Dosing, Sylvester Strittmater, Frank Wilson, Einar Lunde, Corlis Robinson, Merle Miller, Earl Godard, O. C. Smevog, E. E. Hallander, Lyle Keller. A. W. Schroder, John Spence and Leonard Eckerley.

Those members from DeLuxe Engineering Co. are Robert T. Luxford and Sidney Wall. Robert Harkenrider represents Miller Felpax Corp., Winona. Minn. Wesley Bertelson and Velmer Rohde are charter members from the La Crosse Cooler Co.

Members George Reed and Don



Taking the oath of office are: Treasurer Bertelson, Second Vice Chairman Duffy, Secretary McCauley, First Vice Chairman Philpot, Chairman Holly.

F. Duffy, Robert Hagar, Chare G. Hurd and Angus Berg of the La Crosse Trailer Corp.

Others are: Wilbur Quain, E. H. Wittenberg, Henry Wostal and Jack Andresen, La Crosse Stamping & Tool Co.; Carl Witham, Charles W. Stone Co., Minneapolis; J. I. McCauley, Adrian Brietzke, Al Zischke and Earl Olson, Northern Engraving & Mfg. Co.

Representing the Trane Co. are these members: J. C. Easland, Ted Neubauer, James Myrick, Roman Blazei, Ed Smith represent Bump Pump Co.; Helmer Johnson and Ben Johnson, Outers Laboratory; Lloyd Mickelson and C. H. Bottcher, La Crosse Tool and Die Co.; James Polk, Machine Products Corp.; William Hopkins, Hand-i-Preducts; Torn Hott, Aircraft Parts Mfg. Co.; Steve Uhler and Ray Uhler. Badger Stamping & Tool; and Frank Chopieska of Chopie Tool & Die Co.

The technical portion of the program was furnished by Harry Corn, Chief Engineer, Scully-Jones & Co.

ASTE Handbook Awarded to Winners

Evidence of member interest in the five panel discussions featured at the 20th Annual Meeting is provided by the more than 250 questions which were submitted in advance by ASTE members from almost every part of the country.

Winning questions, selected by the specialists participating in the panel sessions, were chosen on the basis of interest. Copies of *The Tool Engineers Handbook* were presented to a total of 15 prize-winners, three for each discussion.

Determining Tolerances

At the panel on turning and forming tolerances, Indianapolis member Seymour Tilles asked "How do you determine the turning and forming tolerances a specific machine is capable of holding?"

S. A. McMillan of the Cleveland chapter won with his question, "Could we save our various employers money by becoming very much more exacting on tooling tolerances, to permit production more freedom, or would we consider the increase in tooling costs against the production quantity? Can anyone mention a good 'rule of thumb' based on his experience, that may apply to others' solution of this question?"

Specifying Limits

From Syracuse came this query of E. H. Kinne, "Which is general industrial practice and which is the most economical—to specify turning and forming tolerances to the maximum allowable degree and scrap all work outside this—or, to specify tolerances to a degree less than allowable but accept under protest work beyond this, however within allowable tolerance?"

Peoria Achievement Pin Awarded to McWilliams

Peoria—Winner of the 1951 achievement award, W. D. McWilliams, was honored March 4 for his work in increasing Peoria ASTE membership by 110 new members. Presentation of the pin was made by Duane Brighton, outgoing chapter chairman.

'Ole' Oleson, chief pilot for Sunstrand Machine Tool Co., spoke on highlights of early aviation at the installation meeting. Other speakers were E. W. Dickett, sales engineer with Sundstrand Machine Tool Co., and Frank L. Suchanek, sales manager for Sundstrand Magnetic Products Co.

New officers of the chapter were sworn in by Robert Bayless, a past chairman.



Under the co-sponsorship of Canadian chapters and national headquarters, ASTE will take its exhibition booth to Toronto for the two-week Canadian International Trade Fair which opens on June 2. The display, which was used in Chicago at the Society's 20th Annual Meeting and Industrial Exposition, will be exhibited in the machinery and plant equipment division. All phases of industry are represented at the Fair, from textile products to farm implements and equipment, household furnishings to office equipment. Members attending the Trade Fair from June 2-13 are invited to make the ASTE booth their informal headquarters.

Bellamy Appoints Society Chairmen

Appointment of national committee chairmen has been announced by Society President L. B. Bellamy.

Edward H. Ruder, vice president, Blackmann & Nuetzel Machine Co., St. Louis, has been named chairman of the constitution and by-laws committee. Heading the editorial committee for the next year is E. Wayne Kay, president of the Raaballoy Corp., East Detroit. Chairman of the education committee is Arthur R. Diamond, mechanical engineer, Jackson Walter Corp., Philadelphia.

Named as chairman of the finance committee is William F. Jarvis, treasurer, Chas. L. Jarvis Co., Middletown, Conn. W. H. Smila, master mechanic, Plymouth Div., Chrysler Corp., Detroit, was appointed to head the honor awards and judicial committees.

A. B. Clark, Haynes Stellite Co.,

Cleveland, was selected as chairman of the membership committee, James O. Horne, owner, J. O. Horne & Co., Rochester, N.Y., was appointed chairman of the program committee. Activities of the public relations committee for 1952-53 are under the leadership of Leslie F. Hawes, president of Southern California Metal Spinning Co., Inglewood, Calif.

R. C. W. Peterson, owner and manager, Peterson Engineering Co., Toledo, remains in his post as national standards chairman. Temporary chairman of the tool engineering research fund committee is Jay N. Edmondson, professor of production engineering at Ohio State University, Columbus.

Chairmen of the professional engineering and ASTE book committees, as well as all committee personnel, will be announced at a later date.

Salt Lake City ASTE officers were installed March 6 at the annual Ladies' Night meeting. From left: Secretary Earl Shipley, Second Vice Chairman Ray Hogan, Chairman John F. Woodhead, Past Chairman Leslie Seager, First Vice Chairman Frederick Preator and Treasurer John Beynon. Dinner and dancing completed the program, held at the University club.





Above: Toledo officers installed March 12 by L. B. Bellamy, (far right) president of ASTE, were Treasurer Armond Arney, Secretary W. J. Toepfer, Second Vice Chairman R. B. Sullivan, First Vice Chairman Joe Kertz, and Chapter Chairman Elmer L. Faber. Below: A group of Seattle members are pictured before boarding buses for Everett, Wash., and a tour of the Weyerhauser Lumber Co. Various methods of sawing and finishing lumber were demonstrated for the group which studied all of the firm's operations.



Seattle Members Tour Lumber Company

Everett, Wash,—A conducted tour of the Weyerhauser Lumber Co, mill in Everett was featured at the February 26 meeting of Seattle's ASTE chapter. More than 120 members enjoyed the chicken dinner served at the plant cafeteria and the tour which followed. New officers of the chapter were elected in a short business session.

H. M. Nicholson, assistant manager of the Everett mill, welcomed the visitors and acted as a guide on the tour, the first of the season for the lumber company which is observing its 50th anniversary this year. Opportunity was given on the tour to study the firm's entire scope of operation.

Beebe Receives South Bend Award

South Bend—Featured at the installation meeting of the South Bend chapter was the presentation of the chairman's pin for outstanding service to Roscoe Beebe by retiring chairman Herbert A. Goltz. Officiating officer at the March 11 business and technical session was Paul A. Beeler, a past chairman of the chapter.

E. W. Dickett, sales engineer, Machine Tool Co., and Frank Suchanek, sales manager, Sundstrand Magnetic Products Co., were technical speakers on the evening's program. Their topics covered "Machine Tools and the Tool Engineer" and "Low Voltage Magnetic Chucks."

New Haven Members Tour Thompson Plant New Haven, Conn.—A plant visite

New Haven, Conn.—A plant visitation of the Henry G. Thompson & So.
Co., Inc., was held the afternoon of
March 13 by members of the New
Haven chapter. About 60 persons stulied operations of the largest band sav
manufacturers in the world. A dinner
followed the tour and at 8 p.m. members and guests heard a technical discussion on Thompson products by the
firm's plant manager, M. J. Radeck,
and the service engineer, J. E. McKar

Mr. Radecki stressed the importance of using the right blade, fee and speed for the type of material being cut. He pointed out that most failures are caused by misuse of blades, such as too much speed, too heavy or too light a feed.

Sample cuts of bar stock were on display to show what type of cut should be obtained.

The chapter's officers were swom in at the meeting, including Chairman John H. Alton, First Vice Chairman Emanuel Lull, Second Vice Chairman John Brozek, Secretary J. A. Kroll and Treasurer N. C. Gilbert, Frank W. Gilbert was awarded the achievement pin for his outstanding work for the New Haven chapter during 1951.

Walter Wagner Conducts Saginaw Installation

Frankenmuth, Mich.—Saginaw Valley chapter officers for 1952-53 were installed March 13 at a meeting held at the Hotel Zehnders. Walter Wagner, past president of the Society, was the officiating officer.

More than 80 members and guestwere present for the evening's program which concluded with a technical discussion by Dr. Max Kronenberg, a consulting engineer of Cincinnati, Ohio, and author of more than 100 papers which have been presented to technical groups in the United States and Europe.

South Bend ASTE officers who took on their new duties at the installation meeting held in March are: Treasurer Walter Profaska, Secretary John Berker, First Vice Chairman J. L. Kemp. Chairman Lawrence Haverstock, Second Vice Chairman Harold Housewerth. Pictured at the Saginaw Valley installation held in Frankenmuth are Clyde Fanning, chairman; Albert Blackman, second vice chairman; Roger Locker, secretary, and Stephan Mathews, treasurer, Walter Wagner, ASTE past president administered the oath of office.







Installation of Denver ASTE officers took place March 4. Officiating officer was Past Chairman Willard Axtell who swore in (from left): Warren L. Foss, retiring chairman and delegate to the 20th Annual Meeting House of Delegates; George Buckee, treasurer; Norman Allen, secretary; Willard Krieger, second vice chairman; Clinton J. Helton, first vice chairman and alternate delegate; and F. J. Geoffrey, chapter chairman. Principal speaker on the evening's technical program was Dr. F. A. Rohrman, director of the Research Foundation and member of the atomic energy board.

Mid-Hudson Members Increase 40 Percent

Poughkeepsie — Membership of the Mid-Hudson ASTE chapter now stands at 220, an increase of 40 percent, announced retiring chapter chairman William W. Schug in his annual report made at the March 7 meeting. The Ladies' Night program also featured installation of officers by J. J. Demuth and presentation of certificates to the 24 members who completed the chapter-sponsored course in hydraulics.

An address on "The Tool Engineer—Past, Present and Future" was delivered by Mr. Demuth, president of ASTE in 1951-52.

He presented certificates to the graduates in the hydraulics course who were: Charles E. Beust, Harry N. Carlson, Raymond Lansing, John C. Luhmann, John J. Millett, Robert Newton, John L. Petz, Joseph L. Petz, Stephen J. Ramus, Joseph C. Nelson.

Other recipients were: Ellis W. Thorpe, Henry J. Tesmer, Walter G. Thompson, Andrew Pryde, Charles J. Popovich, Albert W. Mack, Roland Jones, Thomas Bircher, Eugene S. Pearson, Henry J. Schlessinger, Jack Peale, Lemuel H. Hauver, Kenneth D. Horlacher and Harold J. Depew.

Officers installed in ceremonies conducted by Mr. Demuth include: Joseph A. Crane, chairman; Stanley P. Cook, first vice chairman; Raymond Lansing, second vice chairman, Henry J. Tesmer, secretary and Harry N. Carlson, treasurer.

A merit pin was awarded to Edward E. Phelan for his outstanding service in the chapter's membership drive. The chapter gave a special certificate to Prof. Glenn N. Cox of New York University who instructed the hydraulics classes.

Dinner and dancing at Germania Hall completed the program.

John Keyes Heads Tulsa ASTE Chapter

Tulsa—New officers were elected at the February meeting of ASTE members in Tulsa. With John Keyes as chairman, the slate includes: Don Roberts, first vice chairman; John Newton, second vice chairman; Lester Williams, secretary and Arlie Zumwalt, treasurer. Lou Trainar was elected to the House of Delegates.

The 47 members present heard a discussion on special fixtures for milling machines delivered by Earl Leeds of the Brown Sharpe Mfg. Co.

Peterson Addresses Members in Dayton

Dayton—ASTE's national standards chairman, R. C. Peterson, was the featured speaker at the meeting of Dayton's chapter held February 11. He gave a report of activities of the standards committee and also reviewed his visit to England last summer as a member of visitation committee sponsored by the Marshall Plan.

Officers elected at the meeting include: Chairman Richard Blair, First Vice Chairman Richard Miller, Second Vice Chairman Roy Duseau, Treasurer Vic Bohl and Secretary William Lawrence, Lawrence McAfee was named delegate and C. R. Miller alternate delegate.

Mr. Peterson, who is president and owner of Peterson Engineering Co. and Midwest Die Supply Co. in Toledo and a member of the board of the Sheet Metal Institute, was introduced by Mr. Duseau.

He discussed the current program of the standards committee in the preparation of data sheets, product data and engineering data. He said that ASTE furnishes many of these sheets to engineering schools in universities throughout the country.

Mr. Peterson emphasized the friendly hospitality given to visitors in Britain and compared production methods used there to those employed in the United States.

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Wichita's new ASTE officers are shown with two guest speakers at the March meeting. Seated are: Chairman Orville Strahm, Capt. Carl Konsanke, and Ford Rockwell. Standing: A. A. Reddy, second vice chairman; Harold J. Bales, first vice chairman; James H. Janson, treasurer, and R. O. White, secretary. More than 100 persons attended the meeting.

Bellamy Conducts Toledo Installation

Toledo—More than 200 members of the Toledo chapter helped celebrate the group's fifteenth anniversary with a dinner and installation of officers on March 12. National President L, B. Bellamy officiated.

After the banquet, retiring chairman Dale H. Burke gave a resume of chapter activities during the past year, outlining the progress and complimenting the members for their unity and cooperation.

Mr. Burke presented the chairman's award pin to Robert Langendorfer for his outstanding working as head of the education committee during the 1950-51 when the chapter's engineering scholarship was established.

President Bellamy swore into office the following: Chairman Elmer L. Faber, First Vice Chairman Joe Kertz, Second Vice Chairman Richard B. Sullivan, Secretary Walter J. Toepfer and Treasurer Armond Arney.

Principal speaker for the evening was former price administrator, Michael V. DiSalle, who spoke on the need for price controls in a defense economy. Just returned from Washington, D. C., Mr. DiSalle gave considerable insight into governmental thinking behind price controls.

Toledo Municipal Judge Harvey G. Straub acted as toastmaster for the evening and introduced the 13 representatives of industry, education and the press who were guests of the chapter.

Program Chairman Lewis C. Pascoe handled the arrangements for the evening's activities.

J. J. Demuth, immediate past president of the Society, administers the oath of office to: William Griffith, alternate delegate; Emil Kitzman, delegate; Walter V. Czarnecki, Jr., treasurer; Howard Gross, secretary; Ed Hollingsworth, second vice chairman; Campbell Pittsinger, first vice chairman; and Al Luecke, chapter chairman. National Director T. J. Donovan was a featured speaker at the installation meeting which also marked the Philadelphia's 14th anniversary of its chartering.

Wichita Membership Increases 66 Percent

Wichita—In his annual report na March 12, Retiring Chairman Har Dool applauded the work of the Wich chapter in membership activities during the past year. An all-time high of a are now on the roster, an increase of new members since March, 1951.

A special service pin was await to Peter Adlen for his outstanding war for the chapter. Program feature is included installation of officers.

Speeches were made by Ford Row well, city librarian, who spoke on "D Library Goes Technical" and Capt Capt. W. Kosank, public information of who spoke on "Wichita's Air Force Ba and Jet Flying."

The meeting was attended by near 100 members.

Philadelphia Members Celebrate 14th Birthday

Philadelphia—ASTE marked a fourteenth year in Philadelphia with special anniversary program which is cluded speeches by J. J. Demuth, president of the Society for 1951-52, and in tional Director T. J. Donovan, Jr. election and installation of officers is the coming year and a technical sesion put on by representatives of the Osborn Mfg. Co. of Cleveland.

A birthday cake, complete with a candles, was cut by Past Chairma John Strecker.

Mr. Demuth gave a brief talk on the progress made during the past year by the Society and Mr. Donovan a ported on the membership campaign.

New officers who took office were: A Luecke, chairman; Campbell Pittsings. first vice chairman; Ed Hollingsworth second vice chairman; Howard Gross secretary and Walter V. Czarnecke, Jt. treasurer. Emil Kitzman was named to the House of Delegates and William Griffith was chosen alternate delegate.

The chairman's pin was presented to Mr. Luecke and Mr. Griffith received the past chairman's pin. This year's award for outstanding service to ASTE was given to L. S. Paulsen.



B. Dooglas Addresses Vagara District Chapter

6. Catharinus. Ont.—Importance of engineers in the production of bet-goods in larger quantities at lower s was underscored by R. B. Douglas, president of the Society, at the rch meeting of the Niagara District per held at the Queensway Hotel. In Douglas described the influential e played by the tool engineer who apps abreast of engineering advances constantly improving the standard of ing.

Installation of officers for 1952-53 as performed by Mr. Douglas. The rectairman is John M. Marchyn, wil R. Mitchell is the first vice chair-



R. B. Douglas and J. M. Marchyn

man, Albert A. Clarkson, second vice chairman, Joseph H. Crawford, secretary and James G. Stoddart, treasurer. W. F. Dunn, 1951-52 chairman, presented the chapter's merit award to Mr. Burdett for outstanding service during the past year.

Copies of ASTE Radio Discussion Available

Copies of the discussion on "Can We Have Guns AND Butter" on the Northwestern University Reviewing Stand program, aired March 16 over station WGN, can be obtained by writing to the Office of the Director of Radio, Northwestern University, Evanston, Ill. Enclose ten cents for each copy.

Participating with A. M. Sargent, ASTE past president, on the radio program were Swan E. Bergstrom, director, Metal Working Equipment Div., National Production Authority; Yale Brozen, professor of economics, Northwestern University and John S. Coleman, president, Burroughs Adding Machine Co.

Moderator of the panel discussion, which was held the Sunday before the ASTE Industrial Exposition opened, was James H. McBurney, dean, Northwestern University School of Speech.



New officers of the Rochester chapter are pictured at the March installation meeting. Back row: Gerald Sick, first vice chairman; Marsh Seabrook, executive committee member; Clifford Sears, secretary; Ralph Vigna, executive committee. Front row: V. N. Hansford, executive committee; Don Andrews, third vice chairman; William Kamola, second vice chairman; Donald Kohler and Charles DeMartin, new chairman.

Jackson ASTE Chapter Marks First Anniversary

Jackson, Mich.—L. B. Bellamy, president of ASTE, and Harry E. Conrad, executive secretary, were guests of the Jackson chapter February 26 at a meeting commemorating the group's first anniversary.

Edwin Small was elected chairman at the meeting which was held at the Aeroquip Corp. Other officers chosen include: John Calhoun, first vice chairman Ted Vickers, second vice chairman; Robert Pioch, secretary and Robert German, treasurer. Ted King was named to the House of Delegates. The alternate delegate selected was Daryle Hatt.

The business session was preceded by a dinner and followed by a tour of the Aeroquip factory. Mr. Pioch reviewed the company's history and Jay Osterly showed motion pictures on the use of the firm's products.

James Horne Conducts Installation Meeting

Rochester, N.Y.—Lower Strong Auditorium on the University of Rochester's rover campus proved the setting for the March 3 installation of officers of Rochester's ASTE chapter by James Horne, outgoing chairman.

Featured speaker was G. A. Ebelhare, manager of the Synthane Corp. Mr. Ebelhare showed hundreds of sample parts, demonstrating the wide field applications, in connection with his talk on the processing and machining of laminated plastics.

On February 4 Education Chairman William Kamola presented the chapter scholarship to Alvin Bernreuther, student at Rochester Institute of Technology.

On February 18 the Rochester chapter toured the plant of The Gleason Works, one of the world's largest gear machine tool manufacturers.

The chapter's annual Ladies' Night dinner and dance was held on February 23 at the Brooklea Country Club.

Milwaukee officers, installed in March, are shown just after the ceremonies. From Left: W. E. Klein, chairman; E. J. Anspack, first vice chairman; R. E. Bodendoerfer, second vice chairman; R. P. Bieszk, secretary, and Stephen Pohlhammer, treasurer. The installation meeting was held at the Milwaukee Elks Club. (Milwaukee Journal photograph)





Pictured at Boston's installation of officers held on March 7 are: (back row) Treasurer Robert H. Marsh, First Vice Chairman Wilfred B. Wells, Chairman Harold L. Seekins, Second Vice Chairman Karl G. Nowak and Secretary Thomas B. Walsh. Shown with them (from left) are: Mrs. Marsh, Mrs. Wells, Mrs. Seekins, Mrs. Nowak and Mrs. Walsh.

Boston Officers Installed by Crosby

Boston—Installation of new chapter officers highlighted the fifth annual Ladies' Night meeting of the Boston chapter held March 7 at the Hotel Puritan.

Joseph P. Crosby, second vice president of the Society, administered the oath of office to the new chairmen and presented the past chairman's pin to Prof. Prescott A. Smith. John Morisini received a special service award, the second ever given by the chapter, for the most outstanding work during the year.

It was pointed out at the ceremonies that the ASTE chapter in Boston had grown to be fifth largest in the country.

Dinner was served in the Crystal Room to 200 members and guests and dancing followed the installation to close the evening's program.

Installation Combined With Ladies' Night

Baltimore—Members in Baltimore combined installation of officers and the annual Ladies' Night at their March 7 meeting. T. J. Donavan, a national director of the Society, conducted the installation ceremonies.

Presentation of the award for outstanding service to the chapter was made by the retiring chairman, J. W. Schukraft, to Thomas Burke for his consistent endeavors in promoting chapter activities. Awards were also made to Harry Mecaslin, chairman of the membership committee, Anthony Taormino, George Andrews, Howard Rourke and Donald Wernz for their work in making the membership drive a success.

More than 40 members and their guests enjoyed the evening's program which included dinner, dancing and entertainment provided by William Stokes.

Positions Available

TOOL AND MACHINE DESIGN-ERS—One of Cincinnati's largest permanent design firms has openings in their own office for experienced machine, product and tool designers, and detailers.

Recent engineering graduates or students will also be given consideration. These are permanent positions with a substantial, stable leader in the field. We can offer top starting wages, modern working conditions, paid holidays, vacations, and other benefits. Our policies assure varied experience and unusual opportunities with a future.

New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 37 W. Seventh St., Cincinnati 2, Ohio.

Appointed Plant Manager

John P. Drinjak has been appointed plant manager of the J. C. Warren Corp., Freeport, Long Island, N. Y. He is a member of the Mid-Hudson chapter of ASTE. Ted Harding Receives Indianapolis Award

Indianapolis—Following a dinner meeting at the Athenaeum, ASTE members of the Indianapolis chapter witnessed the installation of officers at the March 6 meeting.

Ted Harding was presented with the ASTE service medal for outstanding chapter services during the year.

H. D. Hiatt, permanent historian of the chapter, administered the oath of office to Denis White, chairman; Joe Penn, first vice chairman; J. P. Enright, second vice chairman; Lloyd Refer, secretary and Ted Harding, treasurer,

Robert Beckmann, assistant director of public relations of the Allison Div. General Motors Corp., Indianapolis, spoke on jet engines in a lecture on "Harnessed Lightning." The subject was illustrated with a film which reviewed the progress of the jet engine from 1945 to the present time.

Mr. Beckmann debunked many misleading statistical reports about our jet engines and planes operating in Korea. He related case histories on jet engines under fire to show how much serious punishment this type of engine can take and still out-perform the conventional reciprocating engine while sustaining flight.

John Gipson Named Nashville Chairman

Nashville—Officers of the Nashville chapter of the Society were elected February 19 at a meeting held at the Andrew Jackson Hotel. They are: Chairman John Gipson, First Vice Chairman W. A. Thornberry, Second Vice Chairman August Dobert, Secretary P. L. Severy and Treasurer Merrill W. Preston.

Guest speaker was E. L. H. Bastian, staff engineer of the Shell Oil Co. His address on cutting fluids, coolants and drawing compounds was followed by a question and answer period.

Chairmen of the Baltimore chapter are shown at the installation meeting. Back row (from left): Richard Coleman, secretary; Donald Wernz, first vice chairman; Herbert Middlestadt, treasurer; Ernest Russell, constitution and by-laws chairman; Robert Brickett, education chairman; Leon Laux, chapter chairman. Front row: Joseph Antonelli, second vice chairman; John Schukraft, delegate; Thomas Burke, standards chairman.





Springfield (Ill.) Chairman R. C. Peek (third from left) receives the congratulations of R. W. Wallace (far right) retiring chairman of the ASTE chapter. Other officers shown with them (from left) are Earl J. Kane, first vice chairman; O. N. Littell, second vice chairman; L. L. Rasch, secretary and Roy Ott, treasurer. They were installed March 4.

T. J. Donovan Installs New Jersey Officers

Newark, N. J.—New officers of the Vorthern New Jersey ASTE chapter were installed by Thomas J. Donovan, national director, at the annual Executive Night program held March 11 at the Robert Treat Hotel. The meeting was sponsored by the Singer Mfg. Co.

Clyde C. Shannon is chapter chairman for 1952-53. Other officers are William Wheaton, first vice chairman; John M. Wanelik, second vice chairman; H. Wilson Ryno, secretary and A. J. Wotowicz, treasurer and assistant secretary.

Mr. Donovan gave a short address on the Society, highlighting its aims and services.

John Roll of Singer expressed the pleasure of his firm in sponsoring the evening's program and introduced the technical speaker, Wilbur J. Peets, chief engineer of the company. Mr. Peets gave a detailed account of machine tooling at Singer.

Harry Whitehall (left) presents Clayton Henderson with the service award of the Grand River Valley chapter for his outstanding work in the ASTE membership campaign during the past year.



Committee chairmen for the chapter are: Albert J. Schmidt, constitution and by-laws; Andrew Hylicki, membership; Vincent Agurti, standards; Loren F. Gay, program; N. James Bosted, plant coordination; G. H. Grossnickle, education; Carl L. Slonkosky, entertainment and Anthony F. Cuoco, editorial.

The meeting, preceded by dinner, was conducted by retiring chairman James Allen.



Thomas Barber, national program committee, was injured in an automobile accident on March 21 on his way to Conrad Hilton Hotel from the Chicago Amphitheatre.

He suffered a badly broken nose, cuts, abrasions and a knee injury when the taxicab in which he was riding was struck by another automobile. He was hospitalized until March 28.

Reviews Past Year's Chapter Activities

Dover, N. H.—Activities of the Granite State chapter during the past year were highlighted in the annual report of C. M. Nystedt, outgoing chairman, presented at the March 11 installation meeting at the American House.

The technical portion of the evening's program was presented by H. L. Murch, chief optical engineer, Jones & Lamson Machine Co. who discussed modern methods of inspection by optical projection.

He outlined the basic principles involved in the construction of modern projectors, giving specific examples which showed the variety of applications. He said that inspection by optical projection permits fast and accurate inspection of many parts which often cannot be checked by any other method.



Below: Mr. Whitehall installs Grand River Valley officers: Chairman Dave McCready, First Vice Chairman Jack Ward, Second Vice Chairman Percy Barber, Third Vice Chairman Selwyn Pritchard, Treasurer Walton Snyder, Secretary Charles Spicer. Above: Retiring Chairman C. M. Nystedt installs Granite State officers: E. Dickerman, treasurer; J. D. Wilson, chairman; J. Mutzbauer, second vice chairman, H. Smith, secretary.



Piedmont Elects 1952-53 Officers

Greensboro, N.C.—Forty-six members and guests of the Piedmont chapter met February 11 for a technical session and election of officers. Dinner preceded the meeting.

Voted into office were C. J. Rix. chairman; E. N. Dietler, first vice chairman; S. B. Jeffreys, second vice chairman; V. A. Hanson, treasurer and A. R. Fairchild, secretary. A. F. Moosbrugger was chosen as delegate and J. D. Schiller was named alternate.

Otto Turchan of the Turchan Follower Machine Co. gave an informal talk on automatic duplicating controls as integral part of machine tools. A lengthy and lively discussion period followed.

Syracuse Members Honor Past Chairmen

Syracuse—About 100 members and guests attended the annual Past Chairman's Night at Hotel Onondaga on February 12. Nine past chairmen were honored by the Syracuse ASTE chapter at dinner and an informal buffet supper at the close of the business and technical session.

Speaker of the evening, Joseph P. Crosby, now ASTE's second vice president, described the tool engineer's contribution to the American standard of living, his role in the present defense effort and traced the phenomenal growth of the Society.

New officers, elected at the meeting, were: Albert C. Vesper, chairman; Robert D. Fulford, first vice chairman; Eugene Bloom, second vice chairman; Raymond D. Coseo, secretary and Victor Fitting, treasurer.

The meeting concluded with a film on "Hunting in Alaska" and a social gettogether over a buffet supper. Carl J. Hoffman, out-going chairman, presided and thanked the group for its faithful help and attendance during the year.



National Director T. J. Donovan, Jr., congratulates Eugene Roth, newly-elected chairman of the Greater New York chapter. Retiring Chairman Ed Galvin looks on. Other officers are: First Vice Chairman Arthus Smedley, Second Vice Chairman M. Ehrenhaus, Treasurer Virginia Martino and Secretary Jay Folfeld.

Harold Noyes and Clifford Howe Honored

Springfield, Vt.—Retiring chairman Floyd McArthur presented an award for outstanding service to Harold Noyes, membership chairman, and a certificate of appreciation to Clifford Howe, who served as treasurer since 1947, at a meeting of the Twin States ASTE chapter held March 12.

Past chairman Lee Davis swore into office the men who will guide chapter activities for the coming year. Installed were: Chairman Robert Laffin, First Vice Chairman George Julien, Second Vice Chairman Martin Parker, Treasurer Glen Easton and Secretary Edward Duclos.

Mr. Laffin introduced the evening's speaker, Benjamin Drohan of South Boston, who entertained the gathering of more than 70 members and their guests with an account of his methods for breaking down sales resistance.

Long Island Roster Lists 309 Members

Garden City, N.Y.—Retiring chairman Henry Maehl announced at the March meeting that 199 new members have been added to the Long Island ASTE chapter since it was organized a year ago. A total of 309 members are listed on this year's roster.

Sheldon Meyers, membership chairman, and his committee, Richard Van Harken, Cass Rokowski, Max Stein, John Thalman and William Griffiths were commended for their excellent work. The whole-hearted cooperation of the entire chapter was also applauded.

Joseph P. Crosby, second vice president of the Society, installed the chapter's new officers. They are: William Rogers, chairman; Art Cervenka, first vice chairman; George Bennett, second vice chairman; George McLaughlin, secretary and Arthur Edstrom, treasurer. Mr. Maehl was named to the House of Delegates with Mr. Meyers chosen as alternate.

G. T. Willey, vice president of Glenn L. Martin Co., gave aircraft-minded Long Islanders something to think about with his talk on "Trends in Aircraft Manufacture."

McDowell Installed as Montreal ASTE Chairman

Montreal, Que.—Past President R. B. Douglas installed officers of the Montreal chapter at the meeting March 13 held at the Canadian Legion Memorial Hall. C. J. McDowell is the new chairman of the group.

J. P. Cloutier, retiring chairman, thanked his officers and committees for their work during the past year and presented Mr. Nashman with the ASTE service pin for his outstanding work as program chairman.

Program speaker was Squadron Leader H. J. Massiah who spoke on principles of jet propulsion.

Shown at the February meeting of the Syracuse ASTE chapter (from left) are: Eugene Bloom, elected second vice chairman; R. D. Fulford, new first vice chairman; Albert C. Vesper, new chapter chairman; and Past Chairmen H. D. Mozeen, Hugo Klix, Donald Babcock, A. H. Mitchel; Joseph P. Crosby, second vice president of ASTE and speaker of the evening; Carl J. Hoffman, retiring chairman; and Past Chairmen T. R. Adams and Charles Allen.





Ft. Wayne officers are shown before the March 12 installation meeting held at the Chamber of Commerce. From the left are: Blaine Girard, second vice chairman; Everette Keese, chairman; Don Welbaum, first vice chairman; Len Sholand, secretary; and Harry Hartman, treasurer. An award for outstanding service was presented to Paul B. Berlien.

J. P. Crosby Installs Worcester Officers

Worcester, Mass.—Officers of the Worcester ASTE chapter were formally installed March 4 by the Society's second vice president, Joseph P. Crosby. Serving for the coming year are: Chairman E. Roland Ljungquist, First Vice Chairman John E. Rotchford, Second Vice Chairman John E. Engelsted, Secretary Louis J. Furman and Treasurer Adam T. Kosciusko. Ralph A. Baker was elected to the House of Delegates. R. E. Rawling was named alternate.

Technical speaker at the dinner meeting held at Putnam and Thurston's was Charles L. Sadon, manufacturing engineer, Aircraft Gas Turbine Div., General Electric Co., Lynn, Mass.

Mr. Sadon's lecture on jet engine tooling was supplemented with slides which showed processes used in manufacturing buckets and blades for jet engines. The history and development of the jet engine were illustrated in a technicolor movie preceding the discussion.

McMillen Conducts Evansville Installation

Evansville, Ind.—Installation of officers for 1952-53 was performed by H. C. McMillen, ASTE's national treasurer, at the March 10 meeting held at the Union Building at Evansville College,

Sworn into office were: Henry Pernicka, chairman; Paul Vierling, first vice chairman; Bernard Pampe, second vice chairman; Art Ullman, secretary and John Race, treasurer.

An address on heat treatment of tool steels was given by Dr. John Kronsbein, who is head of the Evansville College Engineering School. The dinner, business meeting and technical session were attended by 83 members and guests.

Dr. Osborn Officiates at Binghamton Meeting

Vestal, N.Y.—Dr. Harry B. Osborn, Jr., national director and third vice president, installed officers of the Binghamton chapter at a meeting held March 12 at the Vestal American Legion.

Those holding office for 1952-1953 are Chairman William A. Leindecker, First Vice Chairman Howard Bertholf, Second Vice Chairman David O. Williams, Secretary Wendell Harper, Treasurer Philip M. Taylor.

After the installation, the service award pin was presented to Charles King, membership chairman, for his outstanding work in the past year.

For the evening's technical session, Dr. Osborn, who is technical director of Tocco Div., Ohio Crankshaft Co., Cleveland, gave a lecture on induction heating as applied in modern industry. His talk was illustrated with slides.

Berlien Presented Service Award Pin

Ft. Wayne—Installation of officers and presentation of an award to Paul B. Berlien for his outstanding service to the chapter were featured on the program at the March 12 meeting of the Ft. Wayne ASTE chapter. Installing officer was Past Chairman Paul Weitzman and the presentation was made by 1951-52 Chairman Ralph Didier.

More than 40 members attended the dinner, business meeting and technical session held at the Chamber of Commerce.

After the past year's activities were reviewed by Mr. Didier, H. T. Zent of Birchcraft, Inc., Huntington, Ind., gave a talk and demonstration of the technique of internal carving in acrylic plastic. Movies on speed boat racing completed the program for the evening.

Election of officers took place at the Ft. Wayne chapter's February meeting.

A report was delivered by Editorial Chairman Paul B. Berlien on ASTE participation in Engineers' Week, February 17-23. Radio publicity, speeches and programs in Ft. Wayne's five high schools and other special projects were featured throughout the week.

Displays were placed in industrial plants, schools, banks and other public buildings in the city by the six engineering societies which sponsored the activities.

Tri-Cities Member Elected Vice President

Ernest R. Freeberg, Tri-Cities Member, has been elected a vice president of the Eagle Signal Corp., Moline, Ill., according to an announcement made by the firm's president. In addition to his new duties, Mr. Freeberg will continue to direct the engineering activities of the company, a subsidiary of the Gamewell Co., Newton Upper Falls, Mass.

Dr. John Kronsbein (second from right), head of the Evansville College Engineering School, was the featured speaker at the ASTE meeting held on March 12. Shown with him (from left) are Paul Wetzel, education chairman; H. J. Pernicka, chapter chairman and Edward Seibert, program chairman. Dr. Kronsbein spoke on heat treatment of tool steels.







New officers of the Cleveland chapter took office March 2 at installation ceremonies conducted by Fred J. Schmitt, national director-elect of ASTE. Pictured here (from left) are: C. L. Christy, secretary; A. B. Cirbus, treasurer; H. J. Hausrath, second vice chairman; G. W. Carlton, first vice chairman; A. B. Clark, chairman and Mr. Schmitt. Retiring chairman Robert Southwell gave the service award to Harry E. Peiffer. More than 200 persons attended the installation meeting which was held with the American Society for Metals in the Assembly Room of the Hollenden Hotel.

Coming Meetings

CLEVELAND—May 9. "Cold Heading vs. Automatic Screw Machine Work" by David H. Samuelson, chief engineer, National Screw & Mfg. Co., Cleveland.

DETROIT—May 1. Carbide Section: "Machine Tooling with Carbide."

GRANITE STATE—May 13. Plant tour of the new Schiller Power Station, Portsmouth, N. H.

Greater Lancaster—May 20. "Use and Application of Thread Generating Processes" by C. A. Reimschissel, chief development engineer, Landis Machine Co., Waynesboro, Pa.

Hamilton District—May 9. Dinner at 7 p.m., Fisher's Hotel. Plant tour, Studebaker Co.

Long Island—May 12. "Fluid Power in Action" by H. L. Stewart, assistant sales manager, Logansport Machine Co.

Los Angeles—May 16. Annual stag party at the Old Dixie.

Madison—May 13. "Gaging Techniques" by a representative of the Sheffield Corp., Dayton, Ohio.

NORTHERN NEW JERSEY—May 15. "Uses and Abuses of the Twist Drill" by E. A. Brezina, Cleveland Twist Drill Co.

Philadelphia—May 15. "Abrasive Belts to Speed Production" by W. A. Papworth, staff engineer, Porter-Cable Machine Co., Syracuse, N. Y.

PITTSBURGH—May 2. "Industrial Rubber Applications" by a representative of B. F. Goodrich Co.

SEATTLE—May 20. "Apprentice Training" by Thomas McLaren, Brown & Sharpe Mfg. Co.

Tulsa—May 8. "Tool and Production Grinding" by a representative of the Norton Co., Worcester, Mass.

Twin States—May 14. "High-Speed Turning with Carbides" by J. C. Hebert, Jones & Lamson Machine Co., Springfield, Vt.

Schmitt Officiates at Cleveland Installations

Cleveland—National Director Fred J. Schmitt officiated at the installation of officers March 2 at a joint meeting of the Cleveland ASTE chapter and the American Society for Metals. More than 200 members and guests were on hand for the ceremonies at the Hollenden Hotel.

The chapter's distinguished service award was presented to Harry E. Peiffer, who has headed the constitution and by-laws committee, by retiring chairman R. C. Southwell.

Speaker at the meeting was E. A. Inkley, who spoke on "Gems as a Hobby." The program also included a talk and showing of slides on the effect of cutting fluids on machining efficiency.

A. C. Delmont New Mohawk Valley Chairman

Utica, N.Y.—Albert C. Delmont was elected chairman of the Mohawk Valley chapter at a meeting held February 26 at the Chicago Pneumatic Co. plant. More than 100 members were on hand for the voting and a two-hour tour of both the rotary and percussion divisions of the firm.

Mr. Delmont succeeds A. K. Schroeder. Other officers are: First Vice Chairman Earl K. Wheat, Second Vice Chairman Nicholas A. Kinney, Secretary Paul K. Lyman and Treasurer Earl English. Mr. Wheat was chosen to represent the chapter at the House of Delegates and Mr. Schroeder was named alternate delegate.

Frank Gilroy, field engineer with the Chicago Pneumatic Co., described and demonstrated the new hot dimpling machine made by his firm. It is used for riveting the fuselage and other component parts of airplanes.

Ken Jackson of the engineering department, who is in charge of public relations, served as host.

Frederick W. Hoyte

Frederick W. Hoyte, senior member of the Keene, N. H. affiliate of the Twin States ASTE chapter, died on March. A sales engineer with the Kingsbury Machine Tool Corp., Mr. Hoyte had been associated with the firm for close to 25 years.

Charles B. Carlson

Charles B. Carlson, 68, works consultant at Thomas A. Edison, Inc., died March 9 at his home in West Orange, N. J.

A native of Brooklyn, Mr. Carlson joined Edison in 1907. A self-taught engineer, he was superintendent of the laboratory when the Edison phonograph was being developed.

Mr. Carlson was chairman of the Northern New Jersey ASTE chapter during 1949-1950. He was vice president for 20 years of the John Ericson Society of Engineers of New York and was also a member of the Army Ordnance Association.

Phil Huber

One of the founders of the Ex-Cell-0 Corp., Phil Huber died on February 7 at his home in Detroit, Mr. Huber was chairman of the company's board of directors at the time of his death.

When the firm was incorporated as the Ex-Cell-O Tool and Mfg. Co. back in 1919, he was named director and its first secretary. He later filled the positions of chief inspector, superintendent, factory manager, vice president, president and general manager, and was elected chairman of the board of directors.

Gerald Keating

Gerald Keating, 37, member of the Buffalo-Niagara ASTE chapter, died suddenly on February 26. A resident of Kenmore, N. Y., Mr. Keating was a consulting engineer at the Hartfield-Healy Supply Co. Previously he had been sales manager of the Forks Tool and Mfg. Co., Inc. and associated with aircraft and automotive firms in Detroit and Ohio.

George H. Nye

George H. Nye, 57, president of the Circular Tool Co., Inc., Providence, R. I., died March 19 of a heart attack in his hotel room in Chicago while attending the ASTE exposition and annual meeting.

A member of the Little Rhody chapter of the Society, Mr. Nye had been associated with the Providence firm since 1923, when he helped found the company with the late W. B. Hopkins.



Nearly 250 Los Angeles members and guests heard Edward C. Polidor (right), Engineering Specialties Div., speak at the March meeting. Carl Almquist is shown at the left. New officers were installed by National Director Ben Hazewinkel.

Cincinnati Chapter Installs Officers

Cincinnati—A full program was oflered some 60 members and guests who attended the ASTE meeting held February 11 in the club rooms of the Engineering Society of Cincinnati.

New officers for the forthcoming year were sworn in by George H. Simon, a past chairman of the chapter. Joseph Aprile was installed as chairman; Richard B. Niebusch, first vice chairman; Joseph C. Maezer, second vice chairman; Walter R. DeRoche, secretary and Frank Heap, treasurer.

Annual reports from the various committees were also presented at the business session. Retiring Chairman Edgar L. Routzong gave the service award pin to Frank Heap, who has served as chairman of the program committee during the past year.

Technical speaker Ermand L. Watelet, currently director of design of precision tools and gages, Brown and Sharpe Mfg. Co., discussed the use of strain gages in precision measuring equipment,

Elect Attridge to Board

Gerry Attridge, assistant general manager of Lovejoy Tool Co., Inc., Springfield, Vt., has been elected to the firm's board of directors. He is a member of the Twin States chapter.

Chicago ASTE Members Named Vice Presidents

Among the new vice presidents of the Powdered Metal Products Corp. of America are two members of the Chicago ASTE chapter. Carl G. Levin was elected vice president and secretary and M. W. Isaacson was named vice president and sales manager at the company's annual meeting of stockholders.

West Coast News

By Andrew E. Rylander

What with the ASTE Industrial Exposition—and what a show that was—and a flyer into Rockford with Stan Girard, I've had one busy month. All this aside from sundry plant tours and visits in general throughout the Bay Area. In this connection, and to straighten out a general misconception about California in the minds of Easterners, I want to say that San Francisco, not Los Angeles or Hollywood, is the hub of the Golden State.

To me, San Francisco is one of the most interesting cities I have ever visited. Sure, it has its rough spots, but by now considerably gentled, and civic pride is manifested in Golden Gate Park where picnickers depart without leaving so much as a cracker crumb. Right now—April 3—they're celebrating the Maiden Lane Festival amid a riot of daffodils. It's really something!

Got around to the February meeting of Golden Gate chapter, there saw the 1952 officers—Ted Rohrer, Dave Gustafson, Dean Rouland, Jack Moeller and Kerian Shomber—respectively elected chairman, first and second veep, see'y and treasurer by unanimous vote. An excellent and experienced slate of officers, each of whom was stepped up a notch.

Portland, Oregon, chapter seems to be progressing nicely as of date of writing. New officers for '52 include Daniel L. Melody, Melvin S. Nielsen, William D. Hibbs, William A. Bristow and James Seliger in the order as stated above. Heading committees are immediate past chairman Walter Brenneke, by-laws; M. Nielsen, program; J. Barret, standards; G. Healy, public relations; Prof. M. Sheely, education and D. Melody, editorial. That some of the men double in brass is indicative of the go-ahead spirit now prevalent in No. 63.

At the March meeting, held at the Multnomah Hotel, Portland, Andy Winters, service engineer with National Twist Drill & Tool Co., gave a well-rounded talk on "Drills, Taps and Their Troubles".

Speaking of N.T.D. & T. Co., I had a letter from Carl Oxford on return from the convention, saying that one of his first jobs on coming over from Norway in—well, a few years ago—was in the Walnut Creek area. Better come back for a visit, Carl; you'd never know the town now.

Seattle chapter seems to be pegging along at its usual enthusiastic pace. At the February meeting held at Everett Lumber Div. of Weyerhauser Timber Co., Everett, Wash., the following were elected to serve for 1952: chairman, Joe Gembolis; 1st and 2nd veeps, Roy Coady and A. R. Jones; see'y, Frank Stasny and treasurer, Frank Schellhase. One thing that distinguishes Seattle chapter is outstanding public relations and a monthly news letter that just invites attendance.

Had occasion to visit Magna Engineering Co., manufacturers of the "shop-smith" and the magna drill, the latter attracting its full share of interest at the ASTE show. To adequately describe the company's engineering building in Menlo Park, Calif., one would have to go into superlatives. Superficially, it is a swank ranch-type home on a grand scale, mostly glassed from ceiling to floor and set amid beautifully land-scaped grounds. Whether you're inside looking out or outside looking in, it's really something to see.

Also visited Merco Centrifugal Co., San Francisco, where Works Manager Ralph H. Halbach played the role of M.C. The machining of the huge centrifuges is a tool engineer's dream of precision on a grand scale—and here, let me tell you that the West Coast tool engineers needn't take a back seat for anybody. They're really up-and-coming! Among other things Merco has a sizable defense contract in which the tooling and general plant layout leave little to be desired. But, like other West Coast manufacturers engaged on government work, they're cagey about releasing their set-ups for publication.

An interesting sidelight on the visit, Ralph told me that, along with the late Dick Robbins of Carboloy, he was among the first to introduce carbides into the United States. In other words, carbide tooling made its first impact in San Francisco, not in the East as is generally assumed. Dick Robbins went with Carboloy, there to become the 'Old Man', and Ralph stayed on the Coast and there rose to prominence in industry.

While in Menlo Park—reached over the San Mateo bridge, I took time to visit the home of Sunset magazine and there got another insight into the way they do things in California. The building is patterned after a Spanish hacienda, but on a huge scale and includes a most unique arrangement of editorial offices, the latter flanking an enclosed patio. Eastern tool engineers who intend to vacation in California with their wives should include Sunset on their tour.

20th Annual Meeting Papers Available Now!

The following technical papers, delivered in Chicago at the 20th Annual Meeting, are ready for immediate distribution. Mail your order today!

Paper No.	Title	Paper No	. Title
	Criteria for Selecting Sampling Methods	T9	An Analysis of Cost Estimating Principles
S2	Fixed Gage Standards and Pracice		and Practices
S3	Production Line Hardness Testing	T10	Recent Advances in Metal Cutting Science
S4	Speed and Feed Selection for Efficient Drill-		and Practice
	ing	T11	Electro-Mechanical Machining of Hard Ma-
S5	Precision Hole Location Methods		terials
S6	Drill Jig Design for Secondary Operations	T12	Tool Engineers and Electroforming
S7	Die Design for Metal Blanking	T 13	Heat-Treating and Machining of Boron
S8	Die Design for Metal Drawing		Steels
S9	Selection and Treatment of Die Steels	T14	New Developments in Cemented Carbides
S10	Automatic Size Control in Finish Grinding	T15	Multiple Screw Machine Tooling and Meth-
S11	Precision Production Grinding	PD + 0	ods
S12	Finish Grinding Troubles and Remedies	T16	Power Chucking
S13	Electronics in Motor Drives	T17	Strength of Bolted Assemblies
S14	The Tool Engineer Chooses Pneumatic or	T18	Practical Aspects of Tool and Die Heat-
	Hydraulic Drives	7010	Treatment
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T 2	The Function of Cutting Fluids in Modern	121	Cupola Deoxidation Improves Machinability of Iron Castings
mo a	High-Speed Machining	T22	Control of Quality on Mass-produced En-
T3A	Relation of the Tool Engineer to Company Standards	1.44	gineering Parts
TOD	The Part of Standards in Better Customer	T23	Dynatomics—A New Concept in Metal Re
T 3 B	Relations	1.20	moval
T 4	Production Grinding of Cylindrical Parts	T24	Improved Measurements as a Way Toward
1.1	Requiring Extreme Precision		Safer Tolerances
T 5	Producing Deep Holes by Trepanning and		Panel Discussions
1.5	Drilling	Dames Ve	
T 6	Broaching of Internal Gears	Paper No.	
T7	Job-Tests Aid Production Personnel	LS1P	Turning and Forming Tolerances
T8A	New Precision Reference Specimens for	LS2P	Drilling
2012	Surface Finish Control	LS3P	Metal Stamping Dies and Operations
T8B	The Surfagage—An Instrument for Rough-	LS4P	Finish Grinding
	ness Measurement	LS5P	Machine Drives and Controls
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discussions, each

News in Metalworking . . .

TIN INFORMATION OFFICE OPENED BY MALAYANS

Tin producers of Malaya have announced the opening of an office in the United States in order to provide accurate information about tin production and marketing developments. The information center, The Malayan Tin Bureau, is being located at 1028 Connecticut Ave., Washington, D. C.

According to Lynn W. Meekins, director of the information center, Malaya is the world's largest producer of tin and the United States is the world's largest user. "The establishment of The Malayan Tin Bureau reflects the mutual and vital interest of both countries in this strategic metal."

Numerous difficulties which have beset the tin producers during the past
number of years included the Japanese
occupation during World War II which
put them temporarily out of business
as well as resulting in the damaging
or destruction of their mining equipment. During the past four years Communist sabotage and terrorism have further handicapped the producers. However, in spite of the obstacles and the
necessity of starting again from scratch,
they report tin production to have
reached more than 57,000 tons a year.

JAMACIAN ALUMINA PLANT TO LIGHTEN SHORTAGES

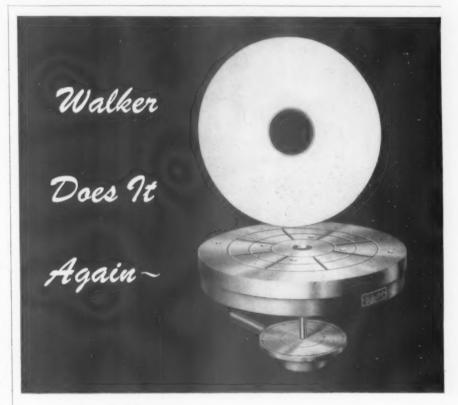
A 150-percent expansion of Aluminium Limited bauxite-alumina production facilities is currently under way in the company's Jamaica facilities. Under this program planned capacity increase from 200 short tons to 500 tons of alumina per day is anticipated. This will be further enlarged to 740 tons per day according to the schedule called for in the company's plans for successive development. This major step is expected to help meet defense needs for aluminum in the United States and other free nations.

Manufacture of alumina in Jamaica, rather than shipping out the raw bauxite ore, reduces shipping costs by more than half, according to company announcement. The alumina, however, can only be reduced to aluminum, the metal, through the use of large amounts of electric power, which is economically available in Canada.

Production from the alumina plant will go chiefly to the new aluminum smelter being built by Aluminum Company, Ltd., a subsidiary of Aluminium Limited, in British Columbia. Its initial anticipated capacity of 90,000 short

tons of aluminum, will create considerable increase in Canada's requirements of raw materials, has resulted in the expansion and acceleration of the construction program in Jamaica, Nathanael V. Davis, president of Aluminium Limited, said in his announcement of the plan.

First production is expected to begin in the third quarter of 1952, while the greatly enlarged plant, on which construction is now well under way, is scheduled to go into operation in late 1953. The British Columbia smelter will be ready for initial operation early the following year.



THE PROBLEM:

To hold a disc of tightly coiled eigarette paper $(3\frac{1}{2})$ miles long) in order to machine it to exact width (29 millimeters).

THE SOLUTION:

Walker Engineers designed this 24" ROTARY VACUUM CHUCK.

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NELCO SIDE MILLS cut faster, cleaner, more profitably. Finer precision work assured with negligible tip wear. Tri-helix cutting face for greater efficiency on steel, width retention, cutting ease.

NELCO SLAB MILLS do better work—quicker. Nickel shim brazed thick carbide tips for increased production. Reduces relative power consumption.

Overhanging tip eliminates grinding of steel when regrinding tools.

NELCO END MILLS reduce costs, increase efficiency. Bore and mill hole in one operation—without chatter. Often banishes finish cuts—retains edge longer—guarantees free and cool milling.

Whatever your individual problems, call on the Nelco field engineer to visit your plant, troubleshoot on your machines. Rely on Nelco engineering and craftsmanship for the answer to <u>increased production at lower cost</u>. For full information on these and other Nelco tools, write TODAY to

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SUMMER COURSES OFFERED IN ENGINEERING FIELDS

Dr. John Gaillard, mechanical engineer on the staff of the American Standards Association and lecturer in industrial standardization at Columbia University, will hold his next seminar from June 23 through 27. The courses will be conducted in the Engineering Societies Building, 29 West 39th St., New York.

The seminars were started in 1947 as a result of requests from companies for assistance in the organization of their standardization work and the training of their men in writing standard specifications.

Details are available from Dr. Gail. lard, 400 W. 118th St., New York 27

The State University of lowa has scheduled an intensive course for factory managers, foremen, industrial engineers, and others with similar problems, to be conducted June 9 through 21, by its College of Engineering.

Production planning, job evaluation, motion and time study, plant layout quality control, supervisory training and labor relations are among the areas to be covered during the course.

New developments in five phases of mechanical engineering will be emphasized in comprehensive two-week courses to be given as part of Massachusetts Institute of Technology's summer program. The program is designed to meet the needs of industry and will devote special attention to machine design and manufacturing methods.

Noting present industry demands to emphasize importance of choosing intelligent and expedient choice of manufacturing conditions, the engineering courses will be based on latest information derived from research and industrial practices.

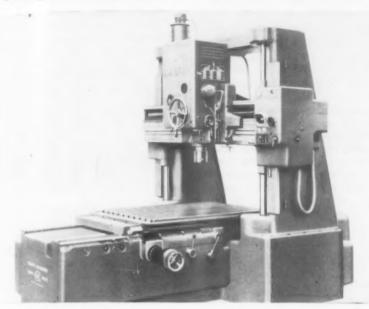
Metal cutting, planned especially for those in industrial production, is scheduled for May 26 to June 6. Internal Combustion Engines, June 9 to June 20. will stress analytical approach to performance and design problems and to planning and control of experimental and development programs.

Lubrication Engineering, June 23 to July 3, will provide study of the application of new techniques and methods in this field. Newest developments in the field of vibration will be reviewed, particularly the radical change in instrumentation requirements, will be the subject from August 4 to August 15. Industrial Photoelasticity will be the final course, August 18 to 30, offering formal instruction in the photoelastic method of stress analysis.

Application forms and further information are available from Dr. Ernest H. Huntress, Director of Summer Session, Room 3-107, Massachusetts Institute of Technology, Cambridge 39.

Tools of Today

Boring & Milling Machines with Viewing Screens



An advance in the design of the large optically set SIP jig boring and milling machines Hydroptic-7P and 8P is announced by the builders.

Viewing screens, on which the graduation lines of the built-in standard scales are optically projected with a large magnification, are substituted for the former microscope eyepieces, thereby eliminating the operator's eyestrain and speeding up settings.

The screens are built into the bed and the crossrail (and also into the horizontal head on the Hydroptic-8P). They have a rectangular surface illuminated by green light. In the field is a movable reticle in the form of a pair of "beaks," the position of which is controlled by the micrometer drum located close by and reading to one ten thousandths of an inch.



Accurate settings are made with the naked eye by simply centering the projected line between the reticle beaks, using the fine positioning handwheels. They are performed in a few seconds only. Rough settings are performed, as formerly, on external scales divided into 0.1 in. The American SIP Corp. T-5-931

Straightening Press

Development of a hydraulic straightening press featuring fast two-dimension positioning of the work is announced by E. W. Bliss Co., Canton, Ohio. Quick positioning is obtained by hydraulic systems which move the press bed from side to side and the plunger assembly from front to back at the touch of a lever. It allows a number of blows to be struck at different places on a single piece without changing the setting on the press table.

Operation of the Bliss press is simple. Levers on the front of the bed control the front-to-back motion of the ram, the side-to-side motion of the bed, and the conventional up-and-down motion of the slide. Once the work is positioned under the ram, a fourth lever located on the front of the crown of the press locks it in position and transfers the output of the pump to the system controlling the up-an-down motion of the plunger.

T-5-932



DE-STA-CO Toggle Clamps speed production on this simple, efficient wood turntable fixture for volume cementing of plastic fish-net floats. Twenty-four Model 210-U clamps are used to obtain quick clamping pressure. The rugged construction of De-Sta-Co clamps has permitted continuous use for over 2½ years producing 240 to 300 floats per hour. Completely retractable, they permit easy insertion and removal of work. De-Sta-Co's positive clamping pressure on the float parts makes a perfect bond and accurate assembly.

Select from over 40 models of De-Sta-Co Toggle Clamps for your work-holding problems in assembly, welding, bonding, machining or inspection of any materials. Positive holding pressures up to 4000 pounds.

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Cleanliness Tester

One troublesome factor in the welding of aluminum sheet is the so-called "cleanliness" of the sheets as presented to the welding head. The surface electrical resistance, in microhms, is a measure of the effectiveness of the oxide removal or cleaning process employed.

The model 151-S microhm meter can readily measure the total surface resistance of two sheets, or coupons, when placed between two dummy electrodes. It can accurately measure a resistance as low as one millionth of an ohm and the readings are practically instantaneous. The instrument scale is 0-75 microhms and is linear. If it is necessary to read higher resistance values than 75 microhms, a selector switch cuts in various multipliers which permit taking measurements up to 750,000 microhms.

The instrument is a shop, or service type instrument designed for maximum ruggedness and reliability. It is contained in a heavy oak case with water-proof finish. Total weight, including internal battery power supply, is 22 lb. Made by the J. W. Dice Co., Englewood, N. J.

T-5-941

Reflex Sight Gage

This reflex sight gage, designed to replace old-style external glass gages with their attendant valves, is now being manufactured by the Rucker Mfg. Co., 4516 Hillis St., Oakland 8, Calif. This gage is adaptable to any equipment where it is desirable to observe the liquid level or the internal activity of tanks, vats or vessels. Liquid level is easily observed from angles up to 15 deg off vertical or horizontal.



The standard model is made with cast-iron housing, fluted pyrex-type sight glass and asbestos gaskets, and is designed for temperatures to 500 deg F and vacuum or pressures to 15 lb. The gage can be furnished with transparent glass, if desired, and the housing made of cast stainless steel or vitreous enameled cast iron. For food industries, the gage is made with sanitary gaskets and is demountable for cleaning. It mounts on existing vessels without burning or welding.

Standard visible length is $4\frac{1}{2}$ inches, but the gage can be manufactured on special orders with visible lengths up to $12\frac{3}{4}$ inches.

Grinding Head

Pratt & Whitney, Div. Niles-Benez Pond Co., West Hartford I, Conn, had developed a high-speed pneumating prinding head, which exhibits characteristics that surmount the difficulties usually associated with high-speed spindles, and also reduces the skill in quired to produce ultimate results in hole accuracy and finish.



Two units cover the wide speed range of 35,000 to 100,000 rpm. This range provides the most efficient cutting speed (approximately 5,000 sfpm) for grinding wheels or points ranging from ½ to ¾ in. in diameter. A low-range unit can be adjusted to hold any selected speed within 35,000 to 50,000 rpm and a high-range unit within 60,000 to 100.000 rpm.

The heads are designed to operate from an air supply providing approximately 25 cu ft per minute at 80 to 100 psi. Normal shop lines are generally sufficient. A line filter is provided to clean the air before it enters the head, where it is distributed through internal passages to a turbine to drive the spindle, a speed governor control, and to the air-lubricated bearings. Line fluctuation is removed by passing the air through a regulating valve to provide even pressure to the speed governor control.

T-5-943

Dog and Driver

An exclusive development for milling machine operators is a dog and driver tool that banishes lost motion, cramping and binding. Designed by Ready Tool Co., 554 Iranistan Ave., Bridgeport, Conn., this tool will provide accurate spacing on taper work and spiral cutting.

The action of a hardened ball, sliding on the hardened stud between ground jaws, acts as a universal balland-socket joint. Work is never cramped or sprung since the movable parts of the jaw provides contact only, without torsional strain.

Supplied in two sizes, style No. 130 for ½ to 2-in. capacity and style No. 132 for ¾- to 2¾-in. capacity. They are furnished complete with either No. 10 or No. 11 B&S taper. Also available with a No. 40 standard milling machine taper or any other special taper as may be required. T-5-944

Mechanical Comparator

The Sigma turret mechanical comparator, introduced by the Cosa Corp., 405 Lexington Ave., New York 17, projets a quick method to control efficiently the quality of mass-produced parts on the production line. This newly developed comparator has only one measuring head with a revolving turret including adjustable fixtures for thecking up to 10 dimensions of a sorkpiece. Fixture capacity is approximately 2 in.

sults i

rnsl

943

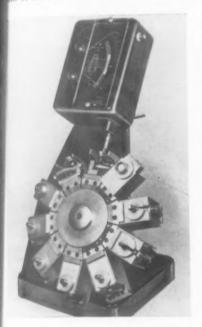
Accurate to four millionths of an nch, the comparator head is mounted n an inclined position on a pedestal fitted with a 10-station indexing turret. Each station holds a fixture to check one of ten dimensions. The contact tip



Designated as model BL-954 the instrument was designed for use with Brush magnetic direct writing oscillographs and medium or low gain amplifiers to permit immediately available permanent records of measurements of electrical phenomena in the microvolt region.

Voltage gain of the instrument is 200,000 times when operated push pull, and when used with Brush direct writing oscillographs and amplifiers is sufficient to give one millimeter of pen deflection on the oscillograph chart per 2.5 microvolts input. Dry B batteries are mounted in the carrying case while either external-storage or dry batteries may be used to furnish A power. A standard cell furnishes voltage for an internal calibration circuit.

Further information may be obtained from The Brush Development Co., Instrument Div. 51, 3405 Perkins Ave., Cleveland 14. T-5-952



of each fixture is adjustable and is set so that, with a master component in position, the pointer registers zero. There are four standard fixtures to measure internal and external diameters, external lengths and internal depths. They are easily adapted to measure different sized workpieces.

A colored strip, marked with a number 1 to 10, is fixed to the base of each fixture and refers to the dimension number on the component drawing, shown on the scale panel. The color of the strip points out the tolerance zone for each dimension, which is indicated by contrasting colors on the arc of the scale panel.

T-5-951

High Gain Preamplifier

This high gain a-c preamplifier is designed to permit the extension of the measurable range of graphic recording instruments or cathode ray oscilloscope into the microvolt region and maintain a relatively flat frequency response from 0.2 to 400 cps.



Wherever quality and precision of parts must meet exacting performance tests, you will find ERICKSON Precision Holding Tools an integral part of the machining set-up. ERICKSON engineers can help you obtain the highest degree of accuracy at production rates you never dreamed possible.

A typical example in the use of ERICKSON expanding mandrels is illustrated above. The photograph shows a loading stand utilizing Erickson mandrels for maintaining precision concentricity on inducers and impellers. Each Erickson mandrel accommodates a wide range of sleeves and each sleeve expands over a range of 1/32". Thus, one mandrel is able to handle a great variety of work.

Only ERICKSON Mandrels grip along their entire length, give positive grip and self release.

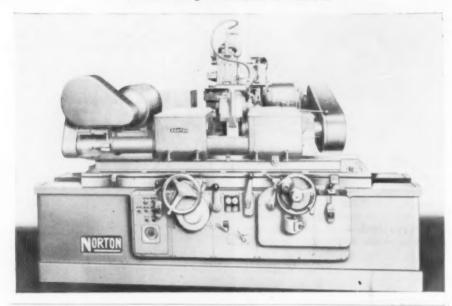
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Contour Jet Blade Grinder





Norton Co. has now developed equipment for production grinding of the external airfoil surface of jet engine turbine blades including buckets, blades, vanes, nozzles, etc.

Known as the Norton compound contour jet blade grinder, this development incorporates type CTU grinding machine features in basic design for achievement of rapid, precise grinding action.

The blades are held on an arbor between synchronously-driven, left-hand and right-hand shape-producing units which impart the figure eight motion to the arbor for grinding blade forms. The cams in each unit give a rise and fall to the machine's work spindle together with an in-and-out swinging motion for controlling blade shape.

Arranging relationship of one unit to the other is possible because of this feature, so that the path of the rotating work spindles when supporting an arbor can cause a blade to be ground to a varying shape from one end of the piece to the other. All this providing the contour consists of elements resulting in straight-line, faired design.

Width of external airfoil surface that can be ground in this new equipment is governed by blade type.

For reduction of manual effort and for consistent productivity, the machine is equipped with automatic grinding cycle. The Norton automatic wheel guard type truing device, operating under push-button control, is available with this machine.

T-5-961

Horning Press

A Horning Press, capable of performing a variety of horning operations, recently developed by the Leslie Welding Co., 2943 W. Carroll Ave. Chicago, combines positive alignment with 5½-in. die space, 12-ton capacity and narrow bed to permit horning of flange notching operations on workpieces or assemblies after forming or assembly.

Punch and die alignment is accurate to 0.0001 in, in the Horning Press. This accuracy of punch and die alignment is maintained by the aligning leaf assembly, to one end of which the punch is fastened. The other end of the aligning leaf assembly is attached to press frame by means of a flat spring serving as a pivot when the punch is raised and lowered. Because of the rigidity of the leaf assembly. except at its flexing point, and crankshaft construction that applies pressure to the leaf at two widely separated points, it is unnecessary to center the load on the punch plate. Notching is permissible in any direction without T-5-962 heels on the punches.

Radiation Meter

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The model \H-2 gammometer is the stest addition to the line of radiation neasuring instruments offered by the Ohmart Corp., 2347 Ferguson Road, Cincinnati 38. The radioactive-sensitive lement in the gammometer is the Ohnart cell, in which radioactive energy converted directly into electrical enrgy. Use of this cell entirely eliminates the need for a high-voltage power supply, and only one vacuum tube is remired. Samples may be placed in a well within the cell, minimizing geometry errors and permitting the measprement of much larger quantities of activity than when slides must be prepared, resulting in maximum precision, The instrument eliminates the need for involved computations as it is direct reading in microcuries.



The sample well in the cell of the AG-2 gammometer measures 23% in. in diameter by 5 in. in depth. Since it will accommodate samples having volumes up to 200 milliliters, 1 microcurie range can be used to measure concentrations of activity down to 5 x 10-10 curies per milliliter. Ranges of the instrument are 1. 10, 100, and 1000 microcuries full scale. A calibration curve giving the relationship between source distance from the cell and instrument response is furnished with each instrument to facilitate measurement of radiation from an external source. The instrument is available calibrated in terms of radium (standard), cobalt-60, or iodine-131. Precision is better than plus-orminus I percent of full scale.

T-5-971

Finishing Machine

The George F. Grant Co., Inc., West Newton 65, Mass., announces the development of a grinding, finishing and polishing unit. Available in two models, the UM-60, 2½ x 60 in. and UM-45, 4 x 60 in.

This unit was designed to meet the problems presented in the production of small parts that must be ground, finished, polished, deburred, etc. off-hand. Employing the contact wheel method of coated abrasive belt polishing, this unit also features platen supported belt grinding, concave and convex contour grinding and polishing and



1/4- to 1/2-in. radius grinding and polishing. Internal grinding attachments are available which are capable of doing areas from 5/8 in. up to 2 in. ID.

Mounted on a fabricated steel cabinet base, the grinder can be rotated 360 deg with automatic locking at every 90 deg. In addition to this feature, the unit has three standard positions of operation: vertical, horizontal, and perpendicular.

T-5-972

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

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LARGE HOLES

... thru any machineable material up to 11/8 INCHES thick!





MARVEL High-Speed-Edge Hole Saws have strength to withstand the terrific peripheral strains of heavy duty operation in lathes, drill presses or portable power tools. They have a high speed steel cutting edge which is electrically welded to a tough, alloy steel body, high speed steel pilot drills, heavy hexagonal shanked arbors and sufficient set for deep drilling. They are self-aligning, as the larger diameter saws float on their arbors and are driven by double drive pins. They will saw round holes accurately in any machineable material.

MARVEL High Speed-Edge Hole Saws come in 35 sizes, from $^1\mathrm{s}^+$ to $4^1\mathrm{s}^+$ They are carried in stock by leading industrial distributors.

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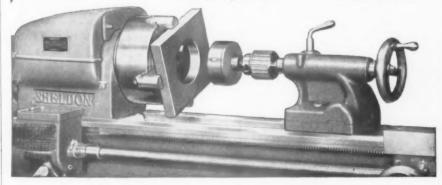
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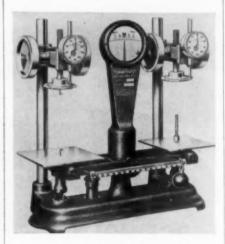
103-14 Roosevelt Avenue Corona 68, New York

Inquiries promptly answered

Spring Tester

A spring testing machine designed to meet the demand for closer control in the production of coiled springs has been placed in production by the Torrington Mfg. Co., Torrington, Conn. The company is a leading manufacturer of spring coiling machines.

The tester provides a standard method of testing both for the manufacturer and the ultimate user.



Features of the tester are that it is relatively inexpensive, simple to use, and has a high degree of sensitivity.

The tester is essentially an even balance weighing scale mounted on a base, with a sponge rubber pad underneath to minimize vibration. The scale has a built-in dashpot to dampen the oscillation of the pointer and pans in testing. Behind the weighing pans are mounted standards which support the spring length measuring devices.

The smaller model measures a load up to the nearest one-hundredth of an ounce and to a capacity of three lb. The larger model measures loads to the nearest fifth of an ounce up to

Surface Broach

A 72-in. stroke, 15-ton vertical hydraulic surface broaching machine has been announced by the American Broach and Machine Co. of Ann Arbor, Mich. Conforming to JIC standards, the machine is equipped with a new type fixed hydraulic cylinder to operate the work slide which is guided in adjustable hardened and ground ways. The new type ways with a larger cross section provide a more accurate and longer wearing machine slide.

The machine will carry the designation SB-72-15 and is being supplied at present with a receding worktable and an automatic indexing unit to broach 95 "Xmas Tree" form slots in turbine wheels. The machine is also available with 90 and 120-in. stroke. T-5-982

Achieve

planned production.

Control

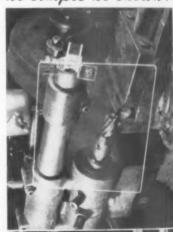
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INDICATE A-5-98-2



Self-setting Clamps

These self-setting clamps for presses and machine tools eliminate packing and save setting time. They are constructed on a design based on the use of three interrelated curved contact surfaces. The new design allows each clamp a gripping capacity for a wide range to accommodate various thicknesses of bolsters.

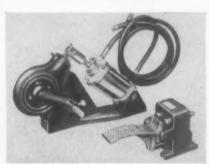


The elimination of packing at one end, which is the normal requirement in the older type of clamps, plus the solid gripping, ensures against the danger of any tool slipping from the position in which it is held. As a result of this solid gripping capacity, an Autoset clamp with a 5/8-in. diameter bolt will hold as safely as a 3/4 in. diameter bolt on the older type of clamps. These clamps have been evolved to meet the requirements of any normal clamping on power and hand presses, lathes, drills, milling machines, shapers, planers, grinders, etc.

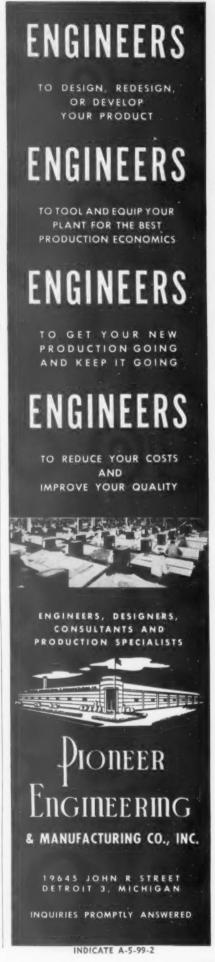
They are available in sizes ranging from 3 in. long with $1\frac{1}{8}$ -in. height capacity to 8 in. long with $3\frac{3}{4}$ -in. height capacity.

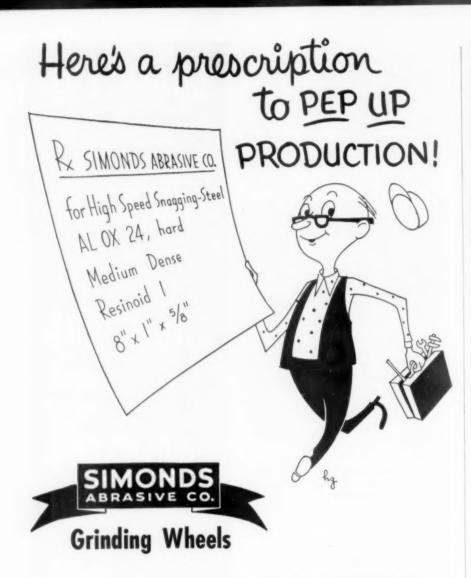
Distributed in the U. S. by the Alpha Tool & Supply Co., Box 119, Westwood, N. J. T-5-991

Hose Fabricator



Schrader air-operated ferrule contracting machine No. 1765 is designed to speed production where quantities of uniform, fitted hose lengths are required. Interchangeable dies enable the machine to be set up quickly for various size ferrules. Fast operation with neat air-tight application of the ferrule is a feature of this unit. The foot-pedal operation permits the use of both hands to feed and remove the work, reducing fatigue. T-5-992







Simonds Abrasive Borolon wheel, Resinoid bonded for high speed grinding! That's the meaning of this prescription ... an effective one for detouring trouble during grinding operations. Chances are you'll find the right prescription for your grinding headaches in our free data book. It lists wheel specifications for all your grinding jobs and gives details on Simonds' complete line, including mounted wheels and points, segments and abrasive grain. Let's send it to you together with the name of your nearby Simonds Abrasive distributor. Write.

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Gear Hobber

A recent change in the hob spindle assembly design of the Hamilton No. 1 gear hobber, as announced by the manufacturer, the Hamilton Tool Co. Hamilton, Ohio, permits 180-deg rotation of the hob spindle turntable, and reverse rotation of the hob spindle its self, without change of work spindle



rotation, or direction of feed. Also, the machine can now use both straight hole hobs and tapered hole hobs with taper either right to left or left to right.

The work spindle and hob spindle can now be reversed independently of each other, and the direction of feed can be changed independent of either. Thus, both conventional and climb hobbing, with either straight hole hobs or tapered hole hobs, can now be done from front to back or from back to front.

T-5-1001

Masonry Drill Bit

Designed for drilling holes 3/4 to 5 in. in diameter in hard masonry, Thunder-Core carbide-tipped drill bits cut through materials such as concrete with bluestone or granite aggregate and even solid granite.



This bit makes it possible for one man to quickly and easily drill holes in hard masonry with no binding. It was specifically developed to save labor costs and reduce fatigue.

Made by the New England Carbide Tool Co., Cambridge 39, Mass.

T-5-1002

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A-5-22	Allegheny Luffum	Steel Corgania.		New booklet contains complete data on standard dis- see-
1.5-184	American Breach &	& Machine Co.,	450	Complete breaching information with photographs, drawings, charts, etc. effected in cetalog.
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A-3-3.3	F. E. Anderson Ol	I Co		Interesting facts about Lusel and information on machine electing, machine odors, etc. offered in free book.
4.5-97	Armstrong-Blum M	Mg. Coursessessianistation	ST-650	Marvel high-speed metal-cutting saws described in bulletin.
4-5-231	Carpenter Steel Co		······································	New fundly guide clearly describes effect of various elements on apark characterization, also gives instructions for spark testing procedure.
A.S-186-3	Chicago Tool & E	inglneering Co	10	Circular ascents accuracy, speed and fine construction of rotary, index, milling table.
3.5-1	The Cincipanti Sha	per Co	N.5	Fustast, almplast and most accurate control possible with new Cincinneti magnetic clutch and brake.
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INDICATE A-5-103-1

New Shaper

The Cincinnati Shaper Co. reports a shaper equipped, as standard equipment, with an electro-magnetic clutch and brake. The inconvenience, inefficiency, and maintenance problem characteristic of the old-style mechanical clutches and brakes are eliminated.



The new clutch and brake insures instant starting and stopping with a single finger-tip control lever. The ram can be positioned quickly and accurately for setting tools by the instant action of clutch and brake. The single control is placed at the most convenient operator's position saving valuable time.

The clutch and brake operate without grab and are powerful and smooth in action. There is no adjustment of the clutch or brake required for the life of the friction surfaces which are estimated to last up to 15 years of normal operation. Torque remains constant throughout the operating life.

T-5-1031

Labeling Tape

A smudge-proof pressure-sensitive labeling tape for industrial labeling and identifying jobs was announced by the TapeMark Co., 321 Cedar St., St. Paul, Minn.

Tradenamed Mark-On, the tape is designed for use in industrial inspection departments, toolrooms, and stockrooms. It can be used for such jobs as labeling test results, rejected parts, dies, raw material, parts boxes, trays, shelves, and bins.

The tape's unique writing surface, located beneath a protective covering of transparent acetate film tape, permanently reproduces any message. Simply use any blunt-pointed object (the wrong end of a pen for example) and write on the acetate film. The message reproduces automatically on the writing surface underneath, and cannot be erased or smudged.

The tape can be applied to any clean and dry metal, plastic, glass, wood, or paper surface. It is resistant to water, acid, and oil. The tape is available direct from the producer in ½- and ¾-inch widths on 648-inch rolls. **T-5-1032**



Even the

smallest size

Reamers

are Standard

with L&I



The Reamer Specialists

LAVALLEE & IDE, INC. CHICOPEE, MASS.

INDICATE A-5-103-2



Welding Positioner

In welding the turbine-bucket wheel to the forged shaft of a turbo-jet engine, an extremely high quality of weld is required, and the welding process must follow strict specifications. The bead is laid down on both sides of the wheel in an exactly defined sequence, and the welded area must be kept at a temperature of 600 deg F during the welding operation.



The J-47 welding positioner consists of a cradle which is power-rotated through 180 deg so that welding can be performed on both sides of the assembly. The assembly is carried on a variable-speed rotating spindle and is enclosed by power-operated insulated doors equipped with ports for welding. Thus the operators have clear access to the work and yet are protected from heat and splatter.

The assembly is maintained at 600 deg F by means of gas burners controlled by motor-operated gas valves and with manually operated secondary air valves. An interlocking system of electric controls maintains ignition, firing and gas pressure.

Welding speed can be varied exactly as required by means of a special heavy-duty, variable-speed gear reducer designed to withstand the blows of the chipping hammer without injury to the gear train.

While the J-47 positioner is designed for hand welding, it is easily adaptable to automatic welding of any approved type. Designed and manufactured by the Syracuse Special Machine Co., 4010 Court St., East Syracuse, N. Y.

T-5-1041

Twist Drills

The Butterfield Division of Union Twist Drill Co., Derby Line, Vt. announces the addition of a line of highspeed and carbon twist drills to the present line of taps, dies and reamers. Besides the standard styles and types of twist drills, the line will include drills especially styled for newer materials such as magnesium, aluminum, plastics, etc., as well as various types of drills for operations such as aircraft extension, heavy duty and automotive series T-5-1042

Solenoid Valve

ld

The Skinne X5 type valve is essentially the same general design as the V5 type, but with modifications to meet of exceed all of the Underwriters Laborstories' requirements for Class I Group D explosion proof construction. New details include top nut which has increased thread engagement and is flanged to increase leakage path, cap which is machined from solid steel and



is brazed to coil housing, and body which provides greater thread engagement with flange and is machined to effect a lap and rabbet joint with coil housing. The coil housing is machined from heavy wall steel tubing and fits the body with an average clearance of less than 0.001 in.

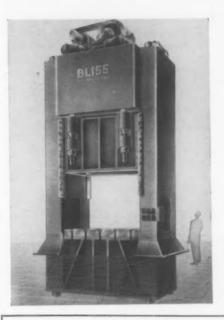
Design allows, in most cases, interchangeability with standard line of valves, since port and mounting hole locations are the same. The valve may be mounted in any position, the electrical conduit may be rotated to any position, and most of the standard wide range of orifice sizes and pressure ratings are available. Valves can be supplied as two-way normally open or closed, and three-way normally open, closed, or directional flow.

Made by Skinner Electric Valve Div., Skinner Chuck Co., Norwalk, Conn T-5-1051

Toggle Presses

A series of four-point, double-action, toggle-drawing presses featuring quick advance and return speeds and extreme accessibility for maintenance purposes, has been developed by E. W. Bliss Co., Canton, Ohio. The presses are specially designed to meet the needs of the automotive and allied industries by making possible higher production rates for large-area, drawn stampings.

Greater production rates have been made possible through use of the eddy current clutch which provides for quick approach to the work, slow-down to give proper drawing speeds, and quick return speed to the top of stroke. Even with comparatively slow drawing speeds, a rapid press cycle is possible.



The slow-down is accomplished by controlled slippage of the eddy current drive clutch through limit switches which can be adjusted to vary the speed of any portion of the draw cycle.

There are three substantial crossmembers in the crown which contains four totally enclosed gears with integral eccentrics for operating the plunger slide. Crown sections beneath the gears form a rigid tie member for the front, center and back transvertical sections. All gearing and toggle bearings inside the crown are lubricated by a cascade oil system.

Each main rockershaft is in one piece and is easily removed from the top of the crown by unshrinking the rockershaft bearing cap tie-rods with Calrod units. The intermediate rockershafts are

also removable from the top of the

ONE of AMERICA'S PRINCIPAL PRODUCERS of DRILL JIG BUSHINGS

ANNOUNCES



Precision Quality Piercing Punches

T-5-1052

of premium steel, in two basic types: Water Hardening Tool Steel - and High Speed Steel

The high quality performance of a punch depends upon:

(a) The Correct Quality Steel

(b) Precision Heat Treatment to gain full advantage of its properties

(c) Qualified Workmanship to insure dimensional accuracy

To these basic requirements must be added modern equipment to make possible production at reasonable prices. We have taken every possible step to produce an outstanding punch.

The water hardening tool steel we have selected is guaranteed to definite standards of grain size and depth of hardenability. For "shock absorber" action, the head and upper part of the shank are drawn back to 45-50 Rockwell C in such manner as to have a hardness gradient, rather than a sharp line of demarcation between different sections.

The underside of the head is ground slightly at the same time as the shank. This insures squareness of the underside of the head with the shank, and minimizes breakage during stripping.

RELATED CONCENTRICITY - As a further example of the 'built-in" qualities of A . B . C Precision Punches: the point is ground concentric with the body, insuring excellent concentricity between

To achieve these A . B . C advantages, plus fine finish and smoothly blended radius to minimize stresses, we developed within our own organization special grinding fixtures and dressing equipment not found in outside markets. And, back of all this is our long record as one of the country's principal producers of premium quality drill jig bushings and fine precision parts for the automotive and other industries.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-105

Short Circuit Finder



A device announced by the International Products Mfg. Co., 1450 South Michigan Ave., Chicago 5, enables anyone to detect and locate shorted windings in generator and starter armatures quickly and easily.

Called the Short Finder, this device consists of an aluminum base casting to which is securely mounted a special type transformer, vertically and horizontally adjustable bearing standards, and a vertically adjustable trouble indicator. Two heavy test prods with leads are mounted at the back of the base casting and are used for blowing

for simple and improved close tolerance scale removal

out copper and solder shorts. The unit is equipped with a foot switch and a 10-ft, 14-2 line cord.

To locate and remove shorts on a generator armature (two pole GDZ GEG, O1A, 1879002, etc. of diameters ranging from 2¾-in. to 3¼-in.) the armature shaft is placed on the bearing standards, the commutator at the right, the armature core centered over the transformer poles and the standards adjusted so that the armature core clears the transformer poles by ½-in. The trouble indicator is then adjusted so that it barely clears the armature without dragging.

Next, the foot switch is pressed. Instantly, the armature rotates into position by itself and stops, while the trouble indicator points to the closest slot in which one of the two shorted coils is to be found. The operator then marks this slot with a piece of chalk, and with the power on, gives the armature a slight spin by hand so that the armature turns itself over, while the trouble indicator points to the closest slot opposite the first indicated slot. Here, again, the operator marks this slot with chalk.

To determine which of the two positions wherein the short is to be found, the armature is gently rocked by hand with the power on. The indicated slot offering the least amount of resistance to this rocking is the slot containing the shorted coil.

T-5-1061

and throws a steady stream of slurry

Fourteen advanced design features incorporated in the new Liquamatte make removal of scale and general cleaning, polishing and finishing of molds and dies easier and less costly. Its simplified de-

sign overcomes the many operating dif-

ficulties often found in wet blasting.

LIQUAMATTE

blasting ...

wet

The Liquamatte has an exclusive vertical pump for slurry recirculation and agitation that overcomes packing leakage, shaft wear and plugging troubles. Ample clearance under the machine makes "good housekeeping" easy. Push button controlled—no valves to operate. The lightweight gun is easily maneuverable

and throws a steady stream of slurry from any angle.

Applications in the tool and die industry are many and varied. Scale is completely removed from precision parts while holding tolerance as close as .0001". "Hand" finishes are produced mechanically in a matter of seconds. The Liquamatte will save you time and money.

GET THE FACTS.
Write today for





Typical beat treated die, one balf of which has been cleaned with the Lianamatte using a fine mesh Liquabrasive.

American MOUAMATTE
WHEELABRATOR & EQUIPMENT CORP. WET BLASTING
856 S. Byrkit St. Mishawaka, Ind.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-106

Ball Bearings

A line of bearing balls identified as Se-Jector Gauged is now being offered by Pioneer Steel Ball, Inc., Unionville, Conn. Developed to meet the demand for more closely matched tolerances within established commercial and precision limits, Se-Jector Gauged bearing balls, by equalizing load distribution contribute to improved bearing performance and longer bearing life.

In conventional gaging methods an occasional out-of-round ball can pass without detection whenever the short axis of the ball is offered to the gaging surfaces which will effect size separation. The Se-Jector Gauge (patent pending) applies principles of selective accuracy not before utilized in the stell ball industry. Each individual ball is subjected to a sequence of multiple gaging which not only selects balls in closely matched tolerances, but rejects any ball lacking the required sphericity as well as any with flats. T-5-1062

USE READER SERVICE CARD ON PAGE OF TODAY INFORMATION 101 TO REQUEST ADDITIONAL TOOLS Pag Gage

The Dubo and gage, made by Standard Gage Condens, of Poughkeepsie, N.Y., is based on the spherical principle of gaging bores and results in several important advantages according to the manufacturer.

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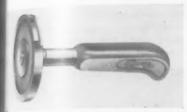
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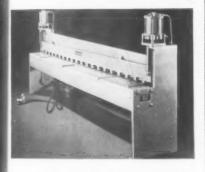


Seventy to 80 percent lighter than the conventional type, the Dubo plug gage reduces operational fatigue, and is much more accurate when the bore diameter is close to the tolerance limit. This gage can also "explore" the bore for dimensional deviations.

T-5-1071

Squaring Shears

An economy line of air power squaring shears for the sheet metal shop is announced by Niagara Machine and Tool Works, Buffalo, N. Y. The simplified construction eliminates such parts as flywheels, gears, clutches, motors and electrical controls, thus reducing initial cost and maintenance to a minimum.



Air from any system found in the average shop with pressures of 70 or 80 psi is all that is necessary. For shops without air, a small air compressor and surge tank will suffice.

Depressing the foot valve automatically clamps the holddown and lowers the crosshead to complete the cut and releasing the foot treadle instantly returns them to top position. A flexible air hose for the treadle permits the operator to trip the shear from any convenient location.

All main components are formed from welded steel plate designed to give maximum strength and rigidity, insuring a longer life of accurate straight line cutting without twist, spring or deflection. Adjustable ways are made from non metallic laminated plastic to avoid scoring and cutting and to hold wear to an absolute minimum.



Garrison Gear Chuck Service starts with your gear print and follows through with a complete service for the life of the chuck. Over thirty years of experience in designing and manufacturing pitch line control gear chucks exclusively, has built up a wealth of engineering knowledge. This knowledge is applied to designing the best custom-built gear chucks for solving your gear problems.

For detailed information as to equipment and price, mail us your gear prints marked to show the operation to be performed and the machine or machines used.



3 more Screw Machine Records!

PRODUCTION INCREASED 79.4%

Part #1 .125 × $2\frac{3}{4}$ " round steel rod. Turn neck, knurl, cut off. 540 pieces per hour with conventional feed . . . 969 pieces per hour with Lipe AML Bar Feed.

PRODUCTION INCREASED 50.9%

Part #2 1/6 x 3" brass tube, 1/2" wall. Inside chamfer one end, square cut-off. Previous production 560 pieces per hour . . . 845 pieces per hour with Lipe AML Bar Feed.

PRODUCTION INCREASED 108%

Part #3 $\frac{7}{32} \times 16\frac{7}{4}$ " steel rod. Form ends and chamfer. One of 14 different jobs on No. 00 B&S Screw Machine equipped with Lipe AML Bar Feed. Average gain in running time: 78%. Average gain in production: 108%.



LIPE AUTOMATIC BAR FEED

Big Production gains on a wide variety of jobs because:

- Stock is fed to screw machine all the time not dependent on operator.
- Feed-out pressure always behind stock.

GUARANTEE

Lipe Automatic Magazine

Loading Bar Feed will enable

a screw machine to produce

at least 90% of its gross

production capacity.

- Eliminates feed fingers.
- Avoids multiple feed finger feedouts.
- Gives maximum output of machine
 no "cutting air."
- Saves in changeover set-up time.

Get full details on how a lipe AML Bar Feed will increase your production and save money. Our engineers will gladly study your problem — no obligation. Write.

Lipe - ROLLWAY CORPORATION Manufacturers of Astamotive Clutches and Machine Tools Syracuse 1, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-108

Abrasive Belt

The 3M brand scallop-edge abrasive belt is designed for automatic precision grinding and finishing of jet turbine and compressor blades in a single operation. In addition it is expected to find wide application in the metalworking industry in the manufacture of hand tools, cutlery and other operations involving small-radius grinding and filleting that was previously done by hand.



In use, the scallops of the belt curve around the edges of the contact wheel, allowing fillet areas to be polished on the edge-contour of the wheel.

In jet-blade grinding two separate steps were previously required to faish-grind each of the more than 2,000 blades in a jet engine—the foil grinding and the root grinding.

Use of the scallop-edge helt on an automatic grinder makes it possible to produce a completely precision-finished turbine blade in a single machine operation requiring only half the time and completely eliminating any hand finishing.

The belt is used on crowned, contoured or rounded-edge wheels, or with shaped back-up supports, and can be used either by machine or by hand.

Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

T-5-1081

Lead Lubricant

A heavy duty grease lubricant, known as Lead-Lube, has been made possible through advances in the field of powdered metallurgy, and by a homogenizing process of Knapp Mills, Inc. The significant factor in this lubricant is its extremely high metallic lead content in the form of a pulverized lead dust, kept in permanent suspension by the Knapp Process.

The function of the metallic lead in Lead-Lube is to form self-lubricating surfaces over all the wearing parts of gears and bearings, so that the actual surfaces will be protected from wear. In the case of older equipment, the metallic lead will resurface pits and scores, and thus restore a degree of efficiency comparable to that which existed before wear.

T-5-1082

High Intensity Illuminator

The Keleket high intensity illuminator makes X-ray film inspection of industrial parts quick, easy and accurate. Radiographs of the thickest of structures become plainly visible, which is particularly important in non-destructive inspection of dense metals, steel forgings, lead, copper, etc. This is accomplished by the even light intensity.

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A full 14 x 17-in. viewing surface permits inspection of the largest films while critical examination of small areas is accomplished before a 3-in spot of four times the overall intensity. This intense illumination permits maximum visualization and evaluation of obscure details, even in films with a density range exceeding 4.5 density.

Smooth roller clips hold firmly, yet do not scratch. Cool front operation allows extended viewing without danger of curling or buckling film. Footswitch control, stepless voltage brightness control and use of standard photoflood lamps are other features.

Further information may be obtained from the Keleket X-ray Corp., 225 W. Fourth St., Covington, Ky. **T-5-1091**

Fire Extinguisher

A pressurized extinguisher designed to smother hazardous fires in metals has been developed by the Ansul Chemical Co., Marinette, Wis,

Expelling a new dry powder known as Met-L-X, the extinguisher has been tested and found highly effective against fires in magnesium, sodium, potassium, zinc, powdered aluminum and other metals.

The Met-L-X powder extinguishes metal fires by forming an air-excluding crust over the burning metal as it contacts the flames. With oxygen excluded, the fire is extinguished.

The powder is moisture-repellent, free-flowing, non-toxic, non-corrosive and non-abrasive. It does not conduct electricity and will not deteriorate under normal conditions. Use of Met-L-X in a gas-type pressure extinguisher was made possible by the small-size par-

ticles of dry powder which make up the compound.

Met-L-X's advantages in putting out metal fires, as compared with shoveling soda ash, for instance are:

- (1) The stress of powder may be directed by the operator, which provides uniform coverage of the burning area and insures most efficient use of the extinguishing agent.
- (2) The metal fires may be fought at a safe distance, minimizing the danger of burns.
- (3) The extinguishing agent cannot be contaminated by water or

other foreign substances, since it is sealed in a container.

The extinguisher container is similar to that of the Ansul dry chemical extinguisher for flammable liquid and electrical fires. However, the nozzle modifications and operating pressures are different.

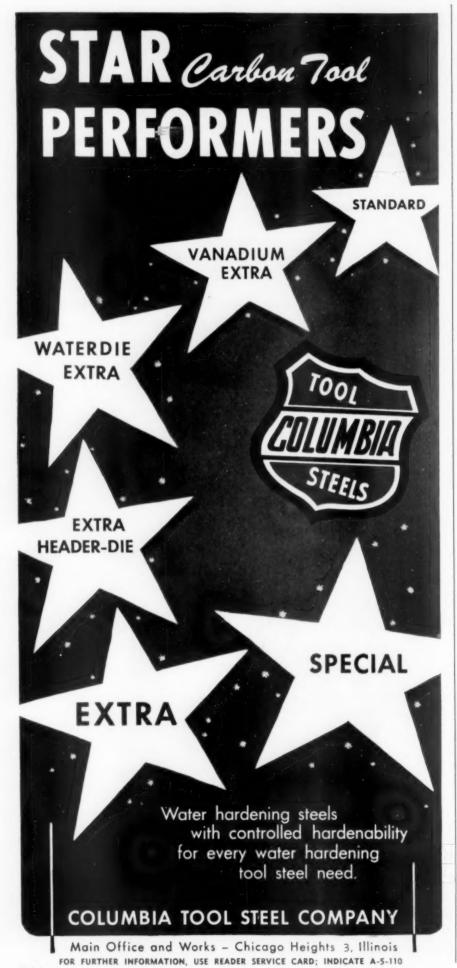
Painted a bright yellow compared with the dry chemical extinguisher's fireman's red color, the new Met-L-X extinguishers are being produced in 30-pound, 150-pound and 300-pound sizes. Larger units including an automatic piped system are also available.

T-5-1092



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-109

· Precision Built Machine Tools Since 1888 ·



Centrifugal Clutch

The Elgin automatic centrifugal clutch, self-energizing, is designed to provide maximum efficiency for any gasoline engine or electric motor wherever load-starting requires a large initial torque. Normal speed of the motor or engine on which the clutch is installed is reached before any load is applied; then automatically and smoothly the load is picked up. Stalls



or slowdowns below normal operating speeds that occur through overloads are eliminated. The clutch automatically disengages when engine or motor speed is reduced for idling.

Chattering is eliminated and positive release of the clutch is assured through the patented movement of the shoe outward and rearward. When motor or engine speed increases to the extent that it exceeds the tension of the clutch springs—a predetermined speed—gentle engagement of the drum is made at a point to the rear of the direct central impact point. Engagement speed is controlled by springs which are interchangeable.

Write for Booklet C-252, Elgin Sweeper Co., Clutch Div., 5 Oak St., Elgin, III. T-5-1101

Rust Preventative

Mitchell Chemical Co., Inc., Stratford, Conn., announces a product known as Metal Guard, a rust-preventative and lubricating oil spray, packaged in a 12 oz aerosol spray container.

Metal Guard is an all purpose oil for many applications in industrial plants. It has excellent rust-preventative qualities and can also be used as a lubricant.

Because of the spray application, it can be very easily sprayed into hard-toget-at areas such as assembled components and interior mechanisms.

Metal Guard has also water-displacing characteristics which allow the oil to get underneath any water or wetness which may be on the metal surface prior to spraying, leaving a continuous film of oil directly on the surface of the metal.

T-5-1102

Automatic Screw Machine

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Small screws, nuts, bolts, spindles, pinions, rivers and many other precision components for clocks, instruments, optical, electrical and toy products, can be produced to extremely close tolerances at high rates of production on the Strolum long-turning automatic screw machine, built in West Germany and now being distributed in the U. S. by Kurt Orban Co., Inc., 205 East 42nd St., New York 17.



Because of the small size of such parts, second-stage machining to attain final dimensions is usually impractical, and the Strohm automatic therefore incorporates the precision operation needed to keep the finished parts within the exacting tolerances demanded.

The machine handles thread lengths up to 1.378 in. and bore depths up to 1.575 in. Accessory equipment permits turning tapers up to 4 in. long.

Two models are available, differing in the sizes of bar stock handled. Type M75 takes up to 0.276 in. round, 0.197 in. square, 0.236 in. hex; M105 handles 0.394 in. round, 0.276 in. square, 0.315 in. hex.

T-5-1112

Reproduction Paper

A document reproduction poper designed to provide the best results in the reproduction of extremely fine detail has been announced by the Eastman Kodak Co.

The paper, Kodagraph contact fineline paper, is expected to prove valuable for reproducing originals with very fine detail, drawings and documents in poor condition and printed half-tone originals. In addition, the company claims that it will make the highest quality negatives from which top quality cloth prints or offset plates can be produced if desired.

Fine-line paper has the same latitude, the same practical speed, and the same uniformity as other types of Kodagraph contact paper. It is suitable for use with all types of contact photocopying equipment and will be available in a wide range of standard sheet and roll sizes, in thin weight.

T-5-1113

SKINNER

POWER CHUCKS

Skinner has a complete line of models for heavy duty production work on engine and turret lathes and automatic machines. Sizes from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws are available. The wedge angle is such that work is gripped positively, either internally or externally, regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates draw bar.



SKINNER

AIR CYLINDERS

Skinner double acting rotating or non-rotating air cylinders, for operating power chucks and fixtures, use a minimum amount of air. Large air ports give quick piston movement. Bronze piston packing spacer reduces friction and insures piston alignment and support. All packings are adjusted automatically by the pressure of the air against the flanges of the packings. Available for 6" to 21" diameter power chucks.

SKINNER

ACCESSORIES

Skinner power chucking accessories include: hand operating valve which is self-sealing and easy operating regardless of position—complete air unit including regulating valve, pressure gage and lubricator—filter to remove all impurities, scale, etc., from the air line—soft blank top jaws—draw bars—draw tubes, etc.

Write for catalog giving complete details on the Skinner line of power and manually operated chucks.

SKINNER CHUCK CO.

354 Church Street, New Britain, Conn.

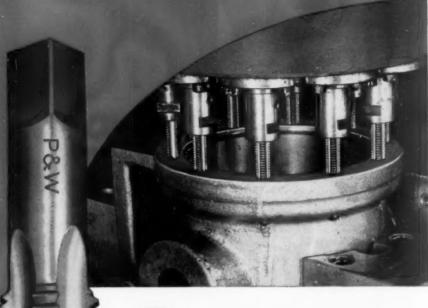
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-111



industrial area

THE CREST OF QUALITY"







TAPS

Every tap bearing the Pratt & Whitney name is the result of the most advanced manufacturing processes under rigid quality control to meet inflexibly high P&W standards, . . . and is backed by more than 90 years' experience in serving all metal working industries successfully. Comprehensive stocks of standard taps are carried in Pratt & Whitney branch offices listed below.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.

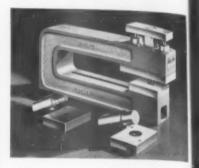
First Choice 🚯 for Accuracy

BRANCH OFFICES AND STOCK ... BIRMINGHAM" - BOSTON - CHICAGO CINCINNATI - CLEVELAND - DALLAS (The Stones Co.) - DETROIT - LOS ANGELE HOUSTON (The Stones Co.) - NEW YORK - PHILADELPHIA - PITTSBURGH ROCHESTER - SAN FRANCISCO - ST. LOUIS - EXPORT DEPT. WEST MARTFORE

CUTTING TOOLS . GAGES . MACHINE TOOLS

Hole Punching Units

Type HS hydra-strip hole punching units for punching holes in mild sted up to 3/4 in. thick have been announced by the Wales-Strippit Corp., North Tonawanda, N. Y. The heart of these extra-heavy-duty units is the Wales Hr. dra-Spring, which provides many times more stripping pressure than mechanical springs of the same volume. This performance is the result of utilizing the compressibility of special fluids. Loads may be changed by a simple adjustment to increase or decrease the volume of the fluid.



These hole punching units are independent and self-contained. All component parts are built into the holder which keep the round or shaped punches and dies in perfect alignment for the life of the units. Unlike conventional dies, nothing is attached to the press ram. The only function of the ram is to depress the punch.

Setting up these units is a simple quick assembly operation; they are ready to start punching with the first stroke of the press ram without adjusting units, punches or dies.

The same group of units may be set up on templets or T-slotted plates in stamping presses and on rails, strip templets or T-slotted plates in press brakes. This interchangeable use of the same group of units permits setups of unlimited hole-punching patterns and fabricating parts the same day a hole-punching design is released for production.

T-5-1121

Carbide Commutator Saw

Gay-Lee Co., Clawson, Mich., has developed a new hub-type solid carbide saw. The tool is designed primarily for commutator undercutting, but can be used to advantage on other slitting and slotting work.

Principal design feature is a brazed ring which forms a part of the hub and makes hub and solid carbide blade completely bonded and rigid. Longer tool life, less tool breakage and increased production over other solid carbide saws have been recorded in initial production use. Diameters on the new hub-type saw range up to 3 in

T-5-1122

The Tool Engineer

Tapping Head

This tapping head is designed expressly for apping 0-80 to 4-40 holes in steel or other material at high speed and with sensitive feel of the tapping operation.



In operation, the Winslow tapping head is mounted to the spindle of a standard drill press. As provision for vertical travel of the tap is built into the tapping head itself, neither the control lever on the drill press or vertical travel of the drill press spindle is utilized.

Control of the tapping operation is through the knurled collar just above the tap. This control collar is held lightly in hand by the operator. A light downward pressure applied to the collar drives the tap into the work and a light upward pressure reverses it. During the tapping operation, the tap can be cleared as necessary by the rapid reverse control. Made by Winslow Product Engineering Corp., 5420 Jillson Street, Los Angeles 22, Calif. T-5-1131

Threading Machine

A sturdy but lightweight, two-inch portable pipe and bolt threading machine has been introduced by the Capewell Mfg. Co., Hartford, Conn. This



Vosper-designed machine provides the plumbing contractor and the pipe fitter with an efficient and economical method of cutting, threading, and reaming pipe either in the shop or on the job. The unit is compact, easy to operate and simple to maintain.

T-5-1132

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION





Gaging Machine



A new and unusual machine for the multiple gaging of the critical dimensions on an automotive crankshaft is announced by The Sheffield Corp., Dayton 1, Ohio. It checks main bearings for size and taper; pilot hole diameters; flange diameters and runout; thrust bearing faces; keyway locations, etc.

In operation the part to be gaged is placed in a loading cradle, elevated above the gaging units for protection and ease of loading. A hand lever is operated to actuate a hydraulic device to automatically lower the part into gaging position. A range of dimensions up to 34 or more can be gaged and read simultaneously by a glance at the float graph, or Airechart formed by the float positions in the Precisionaire columns. The part is easily revolved on

rolls to gage the concentricities and runouts. A hand type airsnap is used for gaging the crankpins for diameter and taper in three places simultaneously on the journal. After the gaging operation is completed, the hydraulic device, actuated as in loading by the hand lever, raises the part to gaging position.

The design of both the instrument and gaging machine is basic and they lend themselves to adaptation to almost any type of inspection on any crankshaft.

T-5-1141

Indexing Table

A mechanical indexing table, known as the Hautau-Turndex, is said to be capable of moving heavy loads from station to station within % of a second indexing time.

The unit, manufactured by Turner Bros., Inc., 2625 Hilton Road, Ferndale, Mich., is designed upon an entirely new pattern of movement, every cycle of which is controlled by the uniform gear tooth area of a master sector gear. The intrinsic accuracy of gears, represented by this master sector gear establishes the basic accuracy of the table.



The significant feature of the table is the set of cams which controls the master sector gear. These cams are designed to directly govern the acceleration and deceleration of the table in order to completely eliminate abrupt starting, stopping, or catapulting action. Crucial start and stop periods are smooth and completely shock-free, regardless of extremely high speeds. Only one horsepower is required to operate a 24-inch unit with an 800-pound work load on the table top.

Standard units are available in from 2 to 26 stations, in any equal division of 360 degrees, but the table may be adapted to a larger number of stations if desired, or applied as a driving unit for indexing larger rotary tables up to 12 feet in diameter.

T-5-1142

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-114

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Model KDR direct reading type hvdraulically operated Brinell hardness testing machine is a production model tester designed for hardness testing of large quamities of identical parts. It



is the type of machine that meets requirements for quality production to strict military quality control standards. With Model KDR an operator can test up to 800 pieces per hour on a "go and no go" basis. Steel City Testing Machines, Inc., 8843 Livernois Ave., Detroit 4. T-5-1151

Radioactive Cobalt

Nineteen Cobalt-60 radiography sources ranging in strength from 50 millicuries to 25 curies have been developed by Tracerlab, Inc., 130 High St., Boston, and are now available for use by foundries, heavy metal fabricators and welding shops.

Because of the versatility and low cost, Cobalt-60 offers an ideal means for the non-destructive inspection of metal objects for flaws, particularly for the occasional user. Gamma rays emitted by Cobalt-60 have energies of 1.17 and 1.33 million electron volts, which correspond quite closely to the effective energy of a 2-million volt X-ray machine. These energies will permit examination of steel from 1/2 in. to 6 in without excessive exposure times.

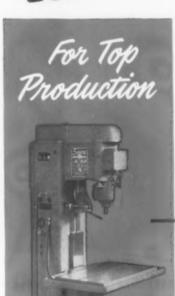
Sources are 21 mm. long by 10 mm. wide, allowing them to be placed inside complex castings; are made of ferromagnetic stainless steel; have a large threaded hole to accept a remote handling rod; a small hole to allow handling with string; and have flats machined on each side to prevent rolling.

In addition to the wide range of sources. Tracerlab has developed a complete line of accessory equipment including source container, magnetic remote landler, survey instruments and personnel safety equipment. T-5-1152

Never Before

SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR! 3800 PER HOUR! 2500 PER HOUR!



Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C"T" Sink 1/16" Hole

Material-Brass Production-4800 per hour Fixture -# 15 Vertical index Equipment - #1-UD Drilling Machine



TAPPING

Tap Two #10-32 Heles

Material—Steel stamping Production—3800 tapped holes per hour

Fixture-#14 horizontal index Equipment-#1-UT tapping machine



THREADING

3/8"-24 Thread-1/2" Long

Material—Die Cast Aluminum Production—2500 per hour Fixture—#10 Drum dial Equipment - #3-TR Threading machine



Snow air operated—electrically controlled machines have built in full uni versal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchroniza-tion of the standard Snow Master Fix-tures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production. Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up

and operation can be handled by a less experienced operator with minimum

MANUFACTURING COMPANY

435 Eastern Ave., Bellwood, Illinois (Chicago Suburb)

Single Spindle Verticals • Two-Spindle Verticals . Two-Spindle Horizontals . Automatic Nut Tapping Machines . Drill Press Tap Heads . Automatic & Semi-Automatic Jigs & Fixtures

Submit Sample Parts for Production & Cost Estimates

Another cost-cutting use for **V**ersatile (## Controls



Solenoid controlled automatic inspection speeds calibration...slashes costs

 $H_{
m and\ coupled\ with\ a\ cycle}$ Solenoid Valves, mounted on this "inspection machine" oil-level control valves. Controlled by the timer, one solenoid moves checking graduates under each valve in the setup to receive oil for measurement of flow rate. After a specified interval, a second solenoid moves the graduates away . . . returning them to checking position. One operator can then check and calibrate 20 units at one time . . . quickly, efficiently.

Whenever you have a problem involving flow control - of gases, liquids, air, refrigerants - let us know. Chances are we have a standard valve that will solve your problem, or that we can design a valve that will suit your requirements.

A-P Controls manufactures a complete line of control valves

Pressure or temperature-controlled throttling and expansion valves • Automatic throttling and expansion valves • Pressure-limiting valves • Water-flow regulating valves • Solenoid valves . Thermo-electric gas valves . Oil-level control valves . Gas- and oil-heater control alves . Control valves for special applications, Call on A-P when you have a control problem.



CORPORATION CONTROLS

(formerly Automatic Products Company)

2402 N. 32nd St., Milwaukee 45, Wis. In Canada: A-P Controls Corp., Ltd., Cooksville, Ont.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-5-116

Metal Forming Bulldozer

When bulldozers are used for metal forming, some die types require top pressure plates which retain the metal within the die during the bending operation. These pressure plates are usually bolted from the top of the die and must be loosened to remove or reposition the work. To overcome this time loss and to speed output, the Hufford press provides vertical hold. down cylinders which replace the bolts and positively secure the pressure plate upon the die during forming. The ev. inders instantly release upon completion of the operation, allowing fast removal of the work and reloading for another cycle.

To effect the vertical clamping, two 25-ton cylinders are mounted on a rolling assembly which may be positioned anywhere along the bulldozer bed. Each cylinder is independently controlled by a four-way selector valve. Pressure may also be varied by reducing valves. These controls are integral with the over-head assembly and mounted on a convenient panel.

For conventional bulldozing when vertical die pressure cylinders are not required, vertical space is increased simply by unbolting and removing the overhead track and clamping unit.

Made by Hufford Machine Works. Inc., 1700 E. Grand Ave., El Segundo. Calif. T-5-1161

Piercing Unit

A line of portable hydraulic piercing units incorporating automatic hydraulic stripping action is based on new hydraulic power cylinder designs.



As an example of the combination of light weight and high capacity achieved in these units, one model weighs only 45 pounds yet exerts a force of 5 tons at 2000 psi working pressure. Maximum capacity is 121/2 tons at 5000 psi working pressure.

Made by Danly Machine Specialties. Inc. 2100 South Laramie Ave., Chicago T-5-1162 50.

Cut-off Saw

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A fully automatic cut-off saw for non-ferrous metals known as the Comet MH, is being introduced by Consolidated Machinery & Supply Co. of Los Angeles. The machine uses a high-speed, carbide-tipped, circular saw blade to cut off aluminum shapes up to 3 by 5 in. or aluminum solids up to 2 by 4 in. Both speed and accuracy



are claimed for the machine; some cuts of approximately 2 by 4 in. aluminum bar stock (of 24 ST hardness) take less than 8 seconds and are held to close tolerance. Maximum capacity of the vise and 12-in saw blade is 3½ by 6 in.

Multiple vee-belts drive the saw arbor and pulley sizes can be changed easily to give any mandrel speed required by the saw blade in use. Feed rate of the ram is infinitely adjustable from 0 to 24 fpm for proper cutting speeds.

T-5-1171

Counter-Chronograph

A combination of equipments, recently developed by the Potter Instrument Co., Inc., 115 Cutter Mill Road, Great Neck, N. Y., completes and automatically records a rapid series of measurements such as individual velocities in a machine-gun burst. Data in digital form is transferred by a direct process to electrically sensitive paper, conveniently visible for study.

This recording counter-chronograph totalizes elapsed time in steps of ten microseconds or less. The completed measurement is recorded on a continuous roll of Teledeltos paper by means of a bank of stylii. Each stylus corresponds to a lamp in the Potter 1 -2 -4 -8 readout. The black traces left on the paper when appropriate stylii are energized momentarily are read in the same manner as the readout lamps.

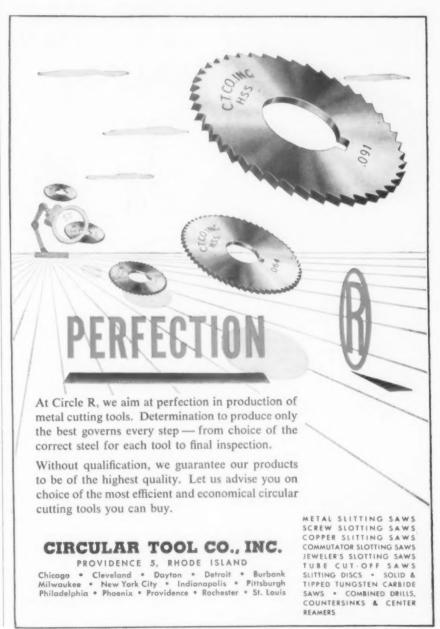
As many as 150 measurements per second can be recorded with a capacity of six digits for each. With fewer digits, certain stylii may be used for timing



or other reference points. The 500-ft paper rolls may be driven at any rate from 2½ to 20 in. per second, registering a well-defined dot at low speed which becomes elongated as the rate of travel increases. The paper is indexed intermittently after each measurement is recorded, merging into a continuous drive when the recording rate exceeds twenty per second.

The recording counter-chronograph is intended to meet requirements existing in the fields of ballistics, frequency measurement, telemetering, geophysical measurements, aerodynamics and wherever microsend precision is demanded.

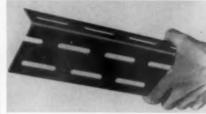
T-5-1172





Fabricating Unit

Acme Steel Co., 2840 Archer Ave., Chicago 8, announces the availability in limited supply of DexAngle, a 10-ft long, 3x1.5x0.080-in. slotted-leg galvanized-steel angle designed for all-purpose industrial fabrication.



The lengthwise rows of slots in this "industrial erector set" unit permit the rapid assembly by bolting of shelving, bins, scaffolding, ladders, assembly tables, motor and machinery mounts, coat-and-hat racks, partitions, chairs, cabinets, desks, conveyor-line structures, benches, skids, trays, machine guards, handrails, and a host of other plant equipment as broad as the imagination of the user.

A hacksaw and a wrench are the only tools needed for assembly. However, the cutting operation can be speeded by the use of a special onestroke shear-type cutter. Equipment can be built, altered or dismantled in a matter of minutes and the DexAngle, regardless of size, is 100 percent reusable. No special brackets, braces, clips or hooks are required. Drilling and welding are unnecessary.

DexAngle is sold by the package. Each package contains ten 10-ft lengths of angle and 75 bolts and nuts. Shipping weight is approximately 110 lb. Shelving panels are available in packages of 12, with 24 bolts and nuts. Caster assemblies are packed four to a package.

T-5-1181

Gear Drive

Boston Gear Works, Quincy 71, Mass., announces a reductor, model C9-U-52, for quick, convenient application and efficient operation of 9-in. diameter screw feed conveyors.

This Boston speed reducer is equipped with a built-in adapter flange for installation by direct mounting with the conveyor trough. A separate subbase assures precise alignment.

These special reductors are also furnished with special diameter output shafts at slightly higher cost, and will likewise be available for other standard sizes of screw feed conveyors.

Full specifications and information on the range of gear ratios, input horse-power, output rpm, rated output horse-power and torque at input rpm of 1800, 1200, 600 and 300 will be supplied on request.

T-5-1182



An ultra precision multi-spindle head of a unique design adaptable to an Excello, Heald or Stoker-Unit Horizontal-Precision Boring Machine.

One ten thousandth tolerance on diameters of bores and plus or minus one ten thousandth tolerance on center distance between bores.

These special heads will cut your direct labor costs and increase production per machine.

Send in your inquiries for further information.

Designers and manufacturers of tools, dies, gages, fixtures, special machines, optical checking equipment and precision instrumentation parts.



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INDICATE A-5-118-2

The Tool Engineer

MICHIGAN

CLAWSON

Technical Shorts..

Development of a process for nickel coating aluminum may find many applications in industrial manufacturing by providing a solution to a major problem in coating of aluminum with nickel to give a stress-free, hard, yet resilient coating. Announcement of this possibility was made jointly by Hamilton Standard Div. of United Aircraft Corp. and Bart Laboratories Co., Inc.

The process is perhaps at the moment most important as a protection for the duralumin propeller blades from the pitting and eroding effect of spray thrown up in sea landings and takeoffs. The process, which has taken almost two years to develop, was done primarily for the Air Force and Navy. During test conditions set up by the Navy, plated blades emerged unscathed, while unplated blades lost approximately 20 percent of their tip areas.

Foreseeing utilization of the process in other fields, A. G. Bart, president of the Bart organization, declared that its variations will open up many applications for aluminum previously considered impossible or impractical. The process combines the hardness and corrosion resistance of nickel with the advantages of aluminum, he pointed out, and added that the bond between the organic synthetic base and the nickel has an extremely high adhesion or tensile strength, and will stand up under

a wide range of temperatures. In this development a synthetic rubber compound is used to establish a bond, hitherto considered impossible between the aluminum and the nickel plate. In use, the bond material is sprayed onto aluminum to the required thickness. After drying the piece is plated with nickel by conventional means, with plate thickness depending upon requirements. With present facilities, the operation takes approximately 24 hours, and the finished pieces have a hardness of 400-40 Vickers and are stress-free. Intricate designs can be given uniform, accurate protection.

More recent application for neoprene, the synthetic rubber familiar as an internal lining, is as an external coating for tanks, process equipment, structural steel, pipelines and similar items. The newer coating, a varied form of old neoprene, is not intended for direct immersion in corrosive chemicals, but provides protection against splash, spill and corrosive fumes and atmospheres explained L. S. Bake of E. I. duPont deNemours & Co., Inc., rubber laboratory, speaking before a section of National Association of Corrosion Engi-

neers recently.

The filmy coating is highly resistant to acids, alkalis, oils, most hydrocarbons as well as to sunlight and weather. In addition, according to Mr. Bake, it is tough and rubbery, and these resilient qualities are inherent so will not volatilize or leach out. Solid content is 60-70 percent giving a thick film per coat, yet it is said to brush readily. It cures ready for service at room temperature in 24 to 48 hours by the addition of an accelerator at the time of use; but a second coat may be applied only two or three hours after the first

if desired. However, a fresh coat bonds well even to a fully cured prior coat—an advantage in patching or touching up an old coating.

The coating has a few disadvantages as well, though. A few ounces of accelerator must be stirred into each gallon of material just before application, and pot life is 12 to 36 hours after acceleration. Before acceleration, shelf life is supposedly at least a year. Another point of consideration is that to insure good adhesion, surfaces must be thoroughly wire-brushed or sandblasted and a coat of primer applied. In color work. colors other than black can be had only at the expense of some chemical and abrasion resistance, while light and pastel colors may be impractical since neoprene darkens somewhat on aging.



Since 1913—through two wars and during the peace years—Eclipse has met the exacting and changing demands of industry for special purpose end cutting tools. What better test? What better recommendation? Our large modern plant can serve you, too. Send your problem to us, today!



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-119

TRADE LITERATURE Free Booklets and Catalogs Currently Offered By Manufacturers

Hobs

When to use ground and unground hobs is treated in 4-page bulletin H-52 which also discusses the proper application of various types of hobs such as precision or Class 'B' ground, accurate unground, and 'roughing' hobs in production of gears and splines; also contains information on tolerances of various type hobs; helpful as a guide to selection and application. Michigan Tool Co., 7171 E. McNichols Rd., De-

Air Devices

"Air Power At Work" pictures and describes 39 different production problems and their solutions through a combination of Mead air devices set up to provide semi-automatic and automatic operations. Especially helpful for those interested in feeding large quantities of small parts to the working machines at varying speeds running from 2,000 to 3,600 per hour. Mead Specialties Co., Dept. NB-74, 4114 No. Knox Ave., Chicago 41.

Tapping

Photos, cross-section diagrams and parts charts on the complete line high speed tapping heads illustrate folder which analyzes working parts and construction, and points out at vantages and possibilities of adaptation to specific job problems; emphasize economy through reduced breakage and maintenance costs, and increased spee and accuracy. Procunier Safety Chuck Co., 18 S. Clinton St., Chicago 6.

L-5-3

MORE HOLE PER HOUR - PER DOLLAR

Increase production of any standard drilling machine by adding a Ligno-matic, the only drill turret with the patented, self-centering principle that guarantees sustained accuracy equal to the drilling machine itself.



FOR ALL CONSECUTIVE DRILL PRESS OPERATIONS

PROVED PRODUCTION INCREASE

- Turret indexes faster than tools can be changed or work moved to another spindle. A single Lign-o-matic will release 5 drilling machines for other work and still show increased production and reduced costs on original job.

VERSATILITY—Fits any standard drilling machine without altering the machine. Handles operations such as drilling, reaming, counterboring, and tapping (on reversible spindle machines), up to 1/2" diameter in any material.

PRECISION - Patented, self-centering tapered drive (A) automatically locks turret spindle (B) into exact alignment with drilling machine spindle (C) for sustained accuracy.

GUARANTEE - May be returned in 10 days for any reason for full refund of purchase price. Two-year guarantee against defective parts.

PRICE - Model D, 6 spindles with No. 2 Jacobs male taper \$235.00 Chucks extra at established prices.

DELIVERY - Currently, 2 weeks.

Burr-Master

Technical bulletin 2041 carries de. scription, method of operation, design features and specifications of company, universal Burr-Master for hypoid pinions: illustrations show fine particulars of operation and results. Modern ladustrial Engineering Co., 14230 Bit. wood Ave., Detroit 4. L-5-4

Broaching

Circular 501 describes recently introduced line of 15- to 50-ton horizontal broaching machines with electrical and hydraulic circuits conforming to III Standards, and which are said to provide for increased broaching and return speeds. American Broach & Machine Co., Div. of Sundstrand Machine Tool Co., Ann Arbor, Mich.

Die Sets

Catalog No. 6, indexed for quick reference, covers standard and special die sets, Die-Co springs, screws, nuts and bolts, accessories, drill jig bushings and toggle clamps; well illustrated with both photos and explanatory drawings. and includes dimension, engineering and price data as well as descriptive text. The Die Supply Co., Cleveland. L-5-6

Castings, Pump

Tables and charts graphically illustrating property evaluations made from recent tests covering wear, resistance to acid corrosion, impact, etc., are among special features of 20-page bulletin 36. "Meehanite Pump Castings"; also includes numerous photos of pump cast ings and various types of pumps utilizing Meehanite castings. Meehanite Metal Corp., Pershing Square Bldg. New Rochelle, N. Y.

Balancing

Complete booklet on balancing, entitled "Static & Dynamic Balancing", is a reprint of Section 89 from the first edition of the Tool Engineers Handbook; provides information of interest particularly to design and methods engineers. Gisholt Machine Co., Madison 10, Wis.



Drilling, Tapping

Catalog illustrates and describes company's production tools including tapper, drill chip breaker, multi-drill, nulti-angle drill unit and precision drilling coolant table for all drill presses; engineering drawings and size and specification tables give full particulars, while text explains operations, special features and advantages and economy of time and money. Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24.

Electrodes, Bronze

Eight-page reprint, "Jobs You Can Do With Bronze Electrodes", describes welding techniques and correct choice of bronze electrodes for wide variety of specific jobs; also includes table of non-ferrous electrode specifications and properties. Ampco Metal, Inc., 1745 S. Thirty-fifth St., Milwaukee 46, Wis. L-5-10

Spark Testing

"A Simplified Guide for Spark Testing Tool and Die Steels" features individual spark diagrams of the 13 standard tool and die steels, with descriptive matter giving detailed spark characteristics for each in order to aid in identification of steels to be sold for scrap, or to classify those that have lost their identity; includes instructions for dressing the grinding wheel and preparing the steel sample as well as outlining the effect of wheel speed on spark stream, explaining the difference in spark between hardened and annealed steel, and describing effect of various elements on the sparks. The Carpenter Steel Co., 354 W. Bern St., Reading, L-5-11

Electrodes, Tool Steel

"Tool-Arc" tool steel electrodes for welding tools and dies are discussed fully in Bulletin AR52-1: includes technical and how-to-do-it information; illustrations and graphs help to clarify text. Alloy Rods Co., York, Pa.

L-5-12

Microscopes, Three Dimensional

Fully illustrated with photographs and sketches, catalog "Bausch & Lomb Stereomicroscopes" cites the many uses, including small part assembly operations, for these optical aids for quality control; emphasizes main features and advantages. Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.

L-5-13

Fluid Power Circuits

Thirty-two page pocket size manual, The Circuit Rider", discusses basic designs in fluid power circuits, explaining representative types and showing the various possibilities afforded through use of different types of circuit designs. Illustrated by schematic diagrams. Logansport Machine Co., Inc., Logansport, Ind. L-5-14

Molybdenum

Technical bulletin 21-G. "Abstracts. Bibliography and Case Histories of Liqui-Moly (Molybdenum Disulfide) Lubrication", contains complete listing of current reference-literature, with important articles abstracted, list of pertinent patents, summary of two years of case histories of field applications of Liqui-Moly lubricants; also gives complete description of the 11 different forms of the lubricant now offered, physical characteristics of the material. packing and price information. The Lockrey Co., Lubricants Div., Southampton, N. Y.

Templates, Plant Layout

Set of 12 templates to facilitate plant layout planning represent various "Cut Master" and "Man-Au-Trol" vertical lathes. Scale is 1/4 in. equals 1 ft. The Bullard Co., Bridgeport 2, Conn.

L-5-16

Screws, Socket Cap

Informative 4-page folder contains brief listing of flat head socket cap screw sizes available plus useful data on pertinent features of line and the laboratory testing methods by which they are checked. Holo-Krome Screw Corp., Hartford 10. Conn.



you a far higher usable output at a far lower cost. The Zagar 20" and 36" machines are inexpensive, fast, easy (for women) to operate, compact and versatile. Inspection is minimized. Let the Zagar Engineering Department recommend the right machine and design the tools to fit machine and job.



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FOR INDUSTRY

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North East West South IN INDUSTRY

Thomas H. West, III, president of Draper Corp., was elected a director of Brown & Sharpe Manufacturing Co. at the meeting of that company's board of directors recently. Entering the service of Draper in 1923 in its engineering department, Mr. West became president of the organization in 1945. He also is currently a director of Pepperell Mfg. Co., and a vice-president of the Machinery & Allied Products Institute.

C. O. Wanvig, Jr., formerly secretary of the Peerless Machine Co., was elected president of the firm at a recent directors' meeting.

Five directors also were chosen at the regular stockholders' meeting. These included C. O. Wanvig, Sr., formerly vice-president and treasurer, who becomes chairman of the board, C. O. Wanvig, Jr., William M. Wanvig, Frank T. Frey and J. P. Hanson.

Orrin W. Barker recently was made chief engineer of Kearney & Trecker Corp. Mr. Barker, who has been with Kearney & Trecker since 1925, has been principally concerned with bed type and special milling machine design and the application of hydraulics to machine tools in general.

Charles R. Crowder was elected first vice-president and a member of the board of directors of The Van Norman Co. at the recent annual meeting of the stockholders of that firm. Mr. Crowder, who has been connected with Van Nor. man since 1929, became vice-president in charge of the Automotive Division in 1945, and vice-president and general manager of the company in 1951.

Similarly, at the annual directors' meeting, T. W. Baush, general export manager for Van Norman and its subsidiary, the Morse Twist Drill and Wachine Co., and George H. Dickinson. sales manager for the Automotive Division, were elected vice-presidents of the firm. Both men have been associated with the firm for some time, having joined Van Norman 28 and 20 years ago respectively.

Appointment of G. G. Willson as manager of the technical service sertion of the "3M" coated abrasives laboratory was announced recently by Minnesota Mining and Manufacturing Co. Mr. Willson will be responsible for all technical service functions of the laboratory as well as for a technical training program recently instituted.

Garvin A. Drew has been appointed assistant vice-president of the Scoville Manufacturing Co., Inc., with respect to the affairs of the Schrader Division. Mr. Drew will continue in his capacity as general sales manager. He also serves as a member of the Schrader Division executive committee and the board of managers.

Edwin M. Miller has been appointed plant superintendent of the Machine Division for The Lincoln Electric Co. Mr. Miller, who has been associated with Lincoln for 29 years, has been head of its production control department for the past 10.

According to recent announcement. William H. Peters has been appoint ed manager of manufacturing of Willys-Overland Motors, Inc. Mr. Peters, who learned the tool and die trade at Willys-Overland in 1916. 16 turned to this company in November. 1951, following 30 years interim association with Ford Motor Co, and a year and a half with Hupp Corp.

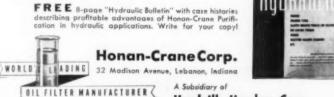


70% of trouble on hydraulic equipment is CAUSED BY OIL CONTAMINATION AND FAILURE

Honan-Crane Purifiers prevent trouble before it starts in hydraulic installations by keeping oil clean and free from damaging contamination. When used to replace ineffective methods or where no purification has been practiced previously, 50% reduction in hydraulic maintenance costs and 4 to 5 times the former safe oil life are common experiences.

Honan-Crane Purifiers prevent excessive wear of pump parts...prevent clogging and sticking of valves, pistons and other hydraulic mecha-

nisms . . . greatly extend the safe-use life of hydraulic oils. Specify Honan-Crane Oil Purification for your hydraulic equipment. Proven by years of dependable service throughout the world.



Houdaille-Hershey Corp.

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The board of directors of Weldit, Inc., have elected W. E. Massey, presilent of the organization. Mr. Massey, as vice-president and sales manager, has been associated with Weldit for more than 32 years.

At the same time, Joseph Smith, formerly sales manager, and son of the late Otis L. Smith, founder of the company, was appointed vice-president in charge of production.



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Clifford R. Meyer

The appointment of Clifford R. Meyer as vice-president and secretary The Morris Machine Tool Co. was announced recently by the firm's board of directors. Mr. Meyer has been asociated with the company for the past four years as secretary.

According to announcement from the Allis-Chalmers Manufacturing Co., J. D. Greensward has been named manager of the recently organized apparatus department. Mr. Greensward also will continue as general manager of the concern's Norwood Works.

In a recent announcement Z. R. Williams was named vice-president and works manager of Portable Electric Tools, Inc. Mr. Williams, who has considerable experience in the production of rotary devices and equipment, has been with PET Tools since 1946.

OBITUARIES

Dr. Lewis Warrington Chubb, diector emeritus of the Westinghouse Electric Company's Research Laboratories, died recently at his home. He was 69 years of age. Dr. Chubb, who was a nationally known leader in the field of science, had some 150 patents to his credit, and in 1946 was selected to receive the John Fritz Medal and Certificate, highest engineering award.

Heyman Rosenberg, founder, officer and director of Parker-Kalon Corp., died recently at the age of 78 years. Mr. Rosenberg, who, with Louis Goldburg, established Parker-Kalon in 1914, has been granted over 200 U.S. and foreign patents on his inventions, most of which covered screws and machinery for their production. Among his many engineering honors were an award by Franklin Institute of Philadelphia and a pioneer inventor's award by the National Association of Manufacturers.

Coming Meetings

May 1-2. Technical Conference on Metal Cutting, sponsored jointly by The University of Tennessee, ASME and ASM, through the Division of University Extension. Knoxville campus of

May 1-7, International Foundry Congress and Show, sponsored by American Foundrymen's Society, Atlantic

May 5-16, British Industries Fair.

London and Birmingham. England.

May 22-24, Sixth annual convention. American Society for Quality Control. Onondaga County War Memorial. Syracuse, N.Y.

June 2-13, Canadian International Trade Fair. Exhibition Grounds, Toronto. Ontario.

June 16-20. Industrial Finishing Exposition, sponsored by American Electroplaters' Society, International Amphitheatre, Chicago; to be held concurrently with AES annual convention. Conrad Hilton Hotel.

GAIRING COUNTERBORES

Interchangeable Holders, Cutters and Pilots . . . quality-built tools for trouble-free Counterboring, Countersinking, Spotfacing

They Are Available from Stock in the three types shown below . . . High-speed cutters in sizes 1/4" to 3. diameter with five flutes . . . and up to 11/4" in threeflute form: quick delivery of larger sizes up to 5" diameter. Holders are stocked with Morse taper and straight shanks.

Counterbore Sets contain assortments of the most active sizes of holders, cutters and pilots, each set in a hardwood box, to meet a wide variety of needs.

Heavy-Duty Type C has tapered cutter shank for perfect alignment, hexagon head for drive. Type C Holders not only take high-speed counterbores and countersinks, but also a line of tungsten-carbide tipped 3-flute counterbores, stocked %6" to 21/2" diameter.

Special Cutters of all kinds are successfully operated in Type C Standard Holders . . . both high-speed and tungsten-carbide tipped . . . one-piece and replaceable-blade . . . designed for multi-diameter boring, chamfering, facing and forming.

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for Quick Change

for Heavy Duty



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Abstracts of Foreign Technical Literature

By M. Kronenberg

Great Britain: Design and operation of a centerless grinder is discussed in an article by B. Spector which appeared in the British edition of Machinery on February 21. The author indicates that this centerless grinder was used for polishing short metal tubes and that it was redesigned, in order to cut the cost of polishing, by replacing the regulating wheel by an endless belt. An automatic feed mechanism was also attached, limiting the work of the operator to loading an oscillating hopper device which accommodates the tunes of various lengths and diameters.

The demand for speeds as high as 100,000 rpm during the past years requires new techniques for obtaining high frequency supply to be used for driving the motors. B. Pringle, in the February 7 edition of Machinery, gives data on the development for obtaining high speeds by frequency conversion. While speeds up to 24,000 rpm have been used for many years in woodworking machinery, the new requirements resulted in designing special types of inductor-alternators which generate frequencies up to 2000 cycles per second.

A considerable amount of time often is spent in designing worm gears before a satisfactory combination of values is obtained. To reduce this time, C. Grundy has developed a calculator and describes this instrument in an article in the British issue of Machinery of February 7. The calculator is based on the logarithmical principle—in the same way as a slide rule—and makes it possible to alter any of the interdependent variables and to assess the effect of the remaining variables such as wheel radius, lead, worm lead angle, ratio, etc.

A committee which was set up by the British Chief Inspector of Factories to examine the safety in the use of milling machines has published its second report (this first one was published in 1949) covering investigations not formerly dealt with. The recommendations put forward in this report are designed to make a choice available of appropriate and suitable safeguards for any particular type of milling machine as discussed in the Engineer of February 22. The recommendations also cover electrical equipment and chip disposal.

A combination of a standard tolerance system with a list of "preferred" diameters would eliminate the waste en-

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turning problems into profits in thousands of plants every day . . . why not let them do the

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your problem direct for recommendations.

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countered in many plants in the purchasing and storing of many gages and other tools according to the opinion of J. J. Eden who discusses this problem in an article published in Engineering of February 22. In the past, much consideration has been given in England and Germany to the preferred number system as witnessed by the British Standard BS 1638-1950 and corresponding German Standards. All the series possess geometric progression and are inheritant inch system is to be used a fractional series system must likewise be used.

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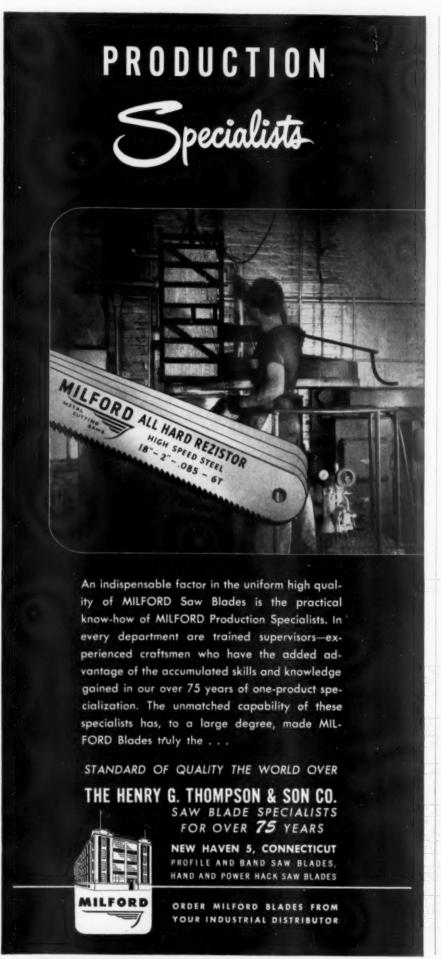
Vo attempt, however, has been made so far to correlate the differences between decimal and fractional series, thus enlarging the gulf between the users of the decimal-inch and metric system on the one hand and the users of the fractional inch system on the other hand. In his article the author proposes a new approach to the development and application of combined series. To obtain a preferred number series, the range from 1 to 10 is divided into equal logarithmic steps. Their natural numbers form the required series. By dividing the logarithmic range by 5 or 10, etc., a "5 series" or a "10 series" is obtained. Tabulations and practical examples demonstrating savings in the dimensioning of parts based on such a system likewise are included in the article.

Switerland: Thermal distortion, deflection and vibration in machine tools is the topic of an article by M. Kronenberg, published in No. 11/1951 of Industrielle Organisation. They affect tool life, surface finish, dimensional accuracy and the maintenance of the machines to a considerable extent, as shown by numerous examples covering milling machines, turret lathes, horizontal boring mills, engine lathes and broaching machines. The author discusses practical testing methods and theoretical considerations and also ways and means for improving adverse conditions.

A borderline case for tool engineers, dealing with the human element in its relation to machine-shop efficiency, is the topic of an article by A. Jung in No. 1/1952 of Industrielle Organisation. The author, a physician, has for a great number of years studied the influence of the frequency of meals on physical efficiency and industrial productivity. His studies were instigated by earlier American investigations winding up with recommendations for the number of meals and the time at which they ought to be taken during the day.

France: The development of carbide tools in France during the past twenty-five years and their effect on the utilization of machine tools is described in an article by A. LeLan published in La





Machine Moderne of February. The author discusses machinability, cuting speed, feed, lubrication, negative rake, positioning of the tool, etc. based on his experience as a technical director of a French machine tool company. It is interesting to note that his experiments show a considerable variation in machinability—as measured by tool lifewith the supplier of the steel while all other conditions were kept constant. He concludes that the microstructure of the steels of the two suppliers might have been different. The article is well illustrated.

Germany: K. Wellinger in Zeischrift des Vereins Deutscher Ingenieure of March 1, likewise considers the effect of microstructure and particularly the possibility to find changes in the material during manufacturing by a microstructural test. The article is illustrated with numerous photos showing various types of microstructure and indicating what information can be obtained in this way in addition to routine testing of tensile strength, etc.

A report on the International Symposium on Scientific and Industrial Research is given by E. Soerensen in Zeitschrift des Vereins Deutscher Ingenieure of February 21. The meeting which was held in November 1951 at London, England, heard papers on "Organization of Research," "Basic and Applied Research," "Research in Europe and USA," "International Cooperation in Research," "Cost of Research," and "Application of Research."

Measuring of forces in the machine shop, and the development of instruments for this purpose during the past years was the content of a paper presented by H. Mintrop before the Annual Meeting of the Verein Deutscher Ingenieure. A review of this paper is published in Werkstattstechnik und Maschinenbau of February. The author considers a great number of devices with which the tool engineer is often not sufficiently familiar, such as instruments for measuring deformation, bending moments, torque, stresses, impact, cutting forces, etc. He indicates that it will become increasingly necessary for production engineers to employ these devices as a means for full utilization of materials and machines and cost reduction.

A new method for developing and manufacturing of templets for contour-milling operations has been devised by K. Schnarbach according to his paper published in the February issue of Werkstattstechnik und Maschinebau. In addition, the author also discusses automatic contour milling methods without employment of templets. This latter method can be used in cases where the curves to be produced are of a sinusoidal nature.







THERE is no one cutting fluid that best meets the requirements of every job. Therefore, Stuart offers you a complete line of cutting fluids. Often two or three Stuart cutting fluids, or varying dilutions of one or two, will answer all the needs of a shop. But, what a whale of a difference it makes when the cutting fluid that is used is the right one for the job!

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2727-49 S. Troy St., Chicago 23, III. INDICATE A-5-129-1 A GUIDE TO SIGNIFICANT BOOKS AND PAMPHLETS OF INTEREST TO TOOL ENGINEERS

Basic Blueprint Reading and Sketching by Olivo and Payne. Published by Delmar Publishers, Inc., 650 Broadway, Albany, N.Y. 162pp; price, \$2.25.

This book is intended to provide instruction material for those who must develop the ability to read blueprints and make shop sketches without drawing instruments.

Each unit of the book is organized to include an outline of specific objectives, a complete explanation and illustration of the principle under discussion, the application of this principle in an actual blueprint, and an assignment to test for mastery.

The forty-two illustrations in the book supplement the text so that it should be possible for a beginner, as well as those in need of a refresher course, to quickly learn the fundamentals of sketching and blueprint reading.

Quality Control Handbook, edited by J. M. Juran. Published by the McGraw-Hill Book Co., N.Y. 18. First edition, 300 pp; price, \$10.00.

This is the first handbook in the field of quality control and it makes available, in ready reference form, the known principles and practices for achieving better quality at lower cost.

The book is designed primarily for reference and use by executives, supervisors and engineers in industry. It contains the specific answers to problems which arise in the daily course of business. This is made possible by careful statement of principles, examples of actual problems and their solutions, and through extensive cross indexing.

Much of the material contained in the handbook has been used for some time in training courses in quality control in industry. This is the first time this information has been collected and printed in one volume.

The first nine sections are devoted to those principles which are universal, no matter what the product or process. Appropriate examples and case histories are included. The last six sections of the volume cover the applications of principles to particular products and processes. Readers are invited to contribute to these sections of the book material for future revisions.

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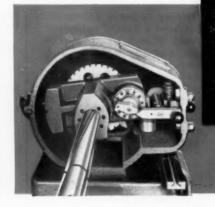
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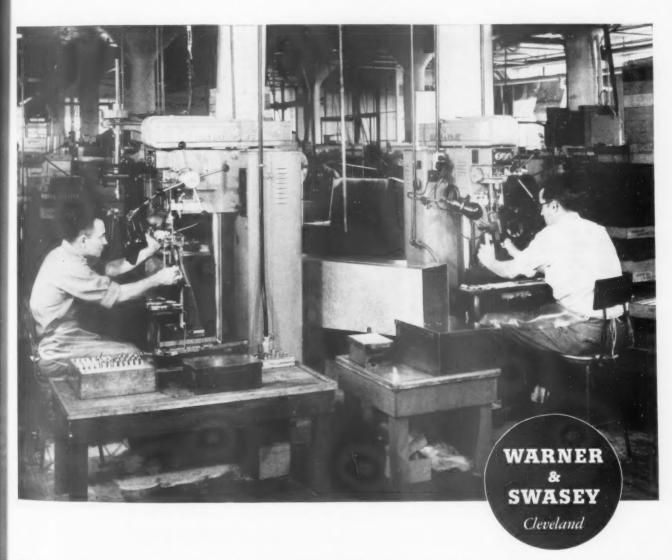
A "make or break" operation

VERY OFTEN when a part reaches a Warner & Swasey Precision
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has been done. Now all that remains is accurate tapping to proper depth,
and the piece is ready for inspection and shipment, or further assembly.

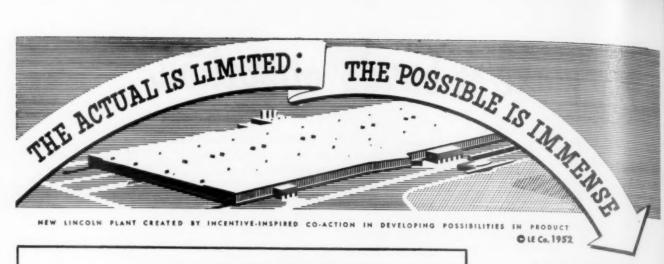
Most of these are precision jobs that must meet Class 3 fits or better. In blind holes, uniform depth tolerances must be maintained. Inaccuracies now would mean a reject of the piece, and the loss of all the previous time-taking machining operations.

It is because these final tapping or threading operations are such "make or break" operations that more and more manufacturers are turning to Warner & Swasey Precision Tapping and Threading Machines. Warner & Swasey's positive lead screw principle, with solenoid-actuated guide fingers to lead the tap in and out of the work, reproduces the accuracy of the tap itself—eliminates any chance of thread inaccuracies caused by drag or backlash.

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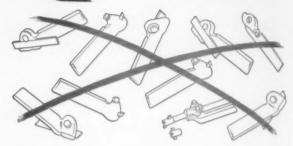
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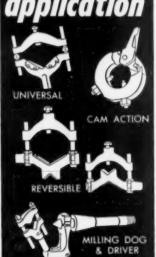
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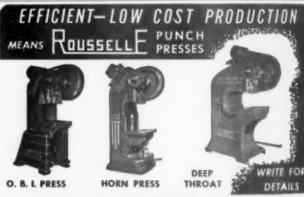
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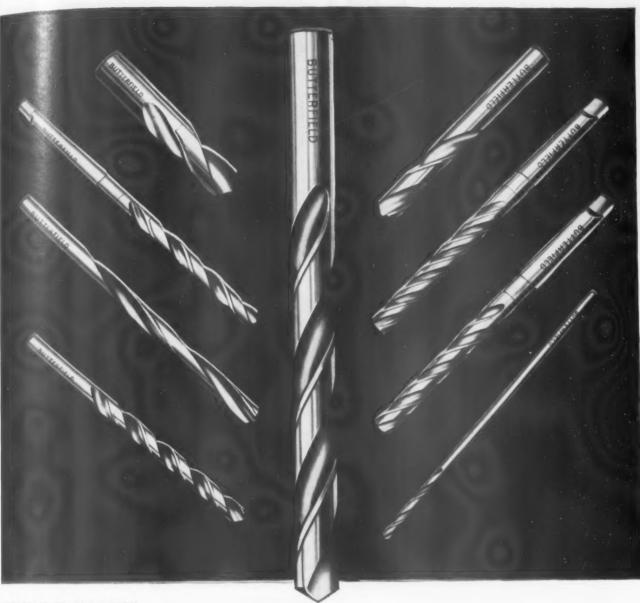
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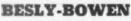
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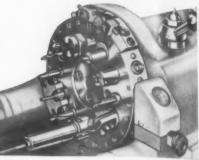
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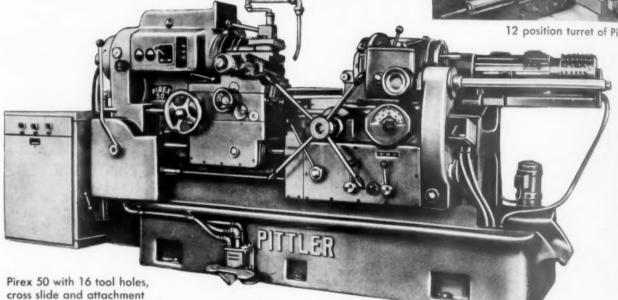
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Spindle speed R.P.M											71-1800	
Feeds											90-2250	18-1800
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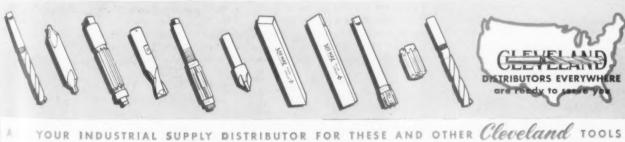
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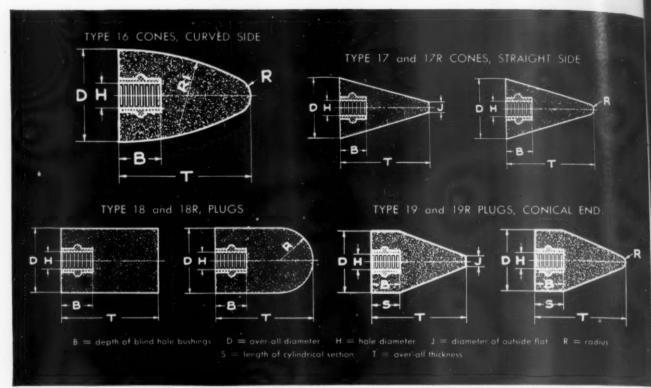
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4 Pounds of Metal Removed in Two Fast Operations

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Second operation: A hydraulically operated arbor holds the part. Tools

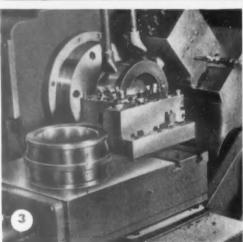
on the front carriage finish turn, face, chamfer and form the radius of the bore. A special rocker arm type carriage at rear tips in shaving tools to form both roller grooves. The form cutters measure 17/8" wide. The husky No. 24 Hydraulic handles this chip load with ease, leaving an extremely smooth finish entirely free of chatter marks. Floor-to-floor time for this operation is also a brisk 2.80 minutes.

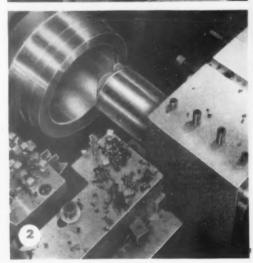
With their completely automatic cycle, these two No. 24 Hydraulics handle an interesting variety of operations with unusual speed.

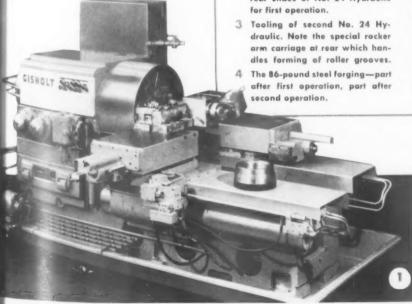
PHOTO CAPTIONS

- This No. 24 Hydraulic handles first operations on bearing races.
- 2 Close-up of tooling on front and rear slides of No. 24 Hydraulic for first operation.







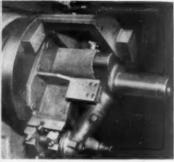




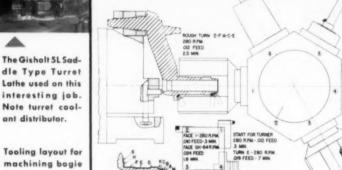
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Special Counterweighted Fixture Does the Trick!

This part was a tough proposition from the holding point of view. It's bogie axle-big, awkward and offset from the turning centerline.

The problem was solved with a Gisholt 5L Saddle Type Turret Lathe and a special counterweighted hold. ing fixture. Fixture and part were bal. anced as a unit on a Gisholt Balancer to provide a faster operating speed.

The previously machined hub is used for locating and driving. Conventional bar tools on the hexagon turret handle the turning and boring of the second hub. Tools on the quick. indexing square turret form, face and chamfer, while the hub is supported with a live center from the hexagon turret.

Floor-to-floor time for the larger of the two bogie axles is 20.5 minutes. Carbide-tipped tools are used throughout, with the spindle operating at 280 r.p.m.

A special counterweighted holding fixture makes it possible to turn a difficult problem into a turret lathe job.

SPECIAL TOOLING SIMPLIFIES PISTON PRODUCTION

A Little Extra Tooling Goes a Long Way



Here's a really businesslike setup for machining a variety of cast iron exhaust pistons. The machine doing the job is a Gisholt No. 4 Ram Type Turret Lathe.

The job is quite standard except for the grooving. Simple operations from the hexagon turret include boring, counterboring, reaming and step-turning. Facing between

ing tool mounted in the standard rear tool post. Grooving is handled from the

the flanges is done by a single form-

quick-indexing square turret on the front of the cross slide. This has been wisely planned around two special tool blocks, one having tools for rough grooving and chamfering, and the other with tools for finish grooving. During the grooving operation, the workpiece is supported by an arbor on the hexagon turret.

Both carbide and H.S.S. tool bits are combined to provide maximum cutting efficiency in a minimum of

machining time.

Tool setup for machining exhaust pistons. Note special tool blocks on square turret for rough and finish grooving.

Exhaust pistons fully machined on No. 4 Ram Type Turret Lathe.

Jet engines present real machining problems. How turret lathes are solving many of these is told in a 4-page photo story. Write for your free copy. It has many helpful ideas.

Special tools on the cross slide of this Ram Type Lathe do rough and finish grooving on a variety of exhaust cylinders.



ALUMINUM FORGINGS WITH INTERRUPTED CUTS

Simplimatic Has Right Speeds and Feeds to Make Job Easy

Here's a job of turning aluminum with interrupted cuts. Normally it would present some real problems

... but not the way it's worked out for he Simplimatic Automatic Lathe.

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It's a bulky aluminum forging which becomes a crankcase center for an aircraft radial engine. A total of seven surfaces is machined, with two of the passes being heavy interrupted cuts. The part is located in the bore and held by an air-operated drawback fixture. Tools on the front slide handle the recessing around the hub. Tools on the center slide chamfer the bore and finish turn the hub. Tools on the rear slide face the hub and the two sets of bosses.

Using a spindle speed of 500 r.p.m. and feeds of .010" and .005", the floor-to-floor time is an even four minutes. The parts are smooth and accurate, even with the interrupted cuts.

Looking into a machined aluminum crankcase center. Note the interrupted cuts.

Close-up, showing tooling on the Simplimatic's three slides.

The Simplimatic is ideal for this job because it permits three in-

FASTERMATIC MAKES FOUR PASSES TO FINISH TAPER BORE

dividual tool slides, each feed-

ing at the best rate of feed

for its particular work on this

aluminum part.

Automatic Cycle Permits Operator to Handle Other Machines

Most of the work on these cast alloy steel steering clutch couplings is in the bore. Four passes must be made through it to finish the taper.

The 2F Fastermatic has an air chuck for holding the part. Work starts with a step drill on the first turret station, cleaning out the cored hole. At the same time, the hub is rough turned and chamfered from the rear independent cross slide. On the second turret station the taper bore is

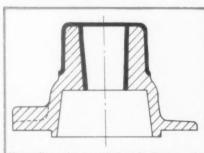
roughed out with gang tools, while tools on the front cross slide finish face the hub and the flange at the base of the hub. The bore is rough taper reamed from station three and finish taper reamed from station four. Floor-to-floor time, using both H.S.S. and carbide tools, is 12.0 minutes.

With the job handled on a Fastermatic Automatic Turret Lathe, an operator is needed only for unloading and loading the parts. The remainder of the time, while the Fastermatic is going through the automatic cycle, he is free to work other machines. All work on the hub and bore is performed automatically and in a single operation by the Fastermatic.

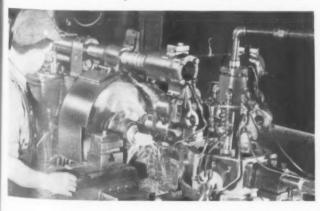
TIME-

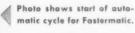
IDEAS

SAVING



Heavy lines show work done by Fastermatic.







Complete couplings, showing taper bore and hub work.



TIME-SAVING IDEAS

FAN BLADES BALANCED 400 PER HOUR

Vertical Machine Sets Record for Production Balancing

Here is the 1SV1
DYNETRIC Balancing Machine doing high volume balancing of small fans. Static unbalance is measured, located and corrected at a rate of more than 400 fans per hour. The operator reads the amount of unbalance directly from the meter in terms of small plugs which are pressed into the root of the blade with a hand tool.

The series of 1SV Balancing Machines are high production machines from every standpoint. They have all the newest electrical and mechanical improvements—plus a new vertical design which reduces operator fatigue to an absolute minimum and thereby increases daily output.

There are four models in the 1SV series—two for static balancing (single plane) and two for dynamic balancing (two plane). Write for literature.



Operators like the 1SV Balancing Machines because they are simple to operate.

At a rate of 400 per hour, the cost of balancing these small fans is insignificant when compared to the added smoothness, greater quietness and longer life of the parts.





A new booklet "Static and Dynamic Balancing," carries helpful information reprinted from the latest A.S.T.E. Handbook. Write for your reprint. Also, ask for details and starting dates of the Gisholt Balancing School, the most complete training program of its kind available.

SUPERFINISHING GIVES BEARING SURFACES MUCH LONGER LIFE

Fast Automatic Operation

The part you see loaded in this Special Model 50 Superfinisher is a stainless steel fan shaft rotor. The two bearing seals, one on each side of the large O.D., are the Superfinished surfaces.

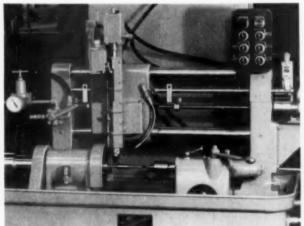
The parts come to this machine with the bearing surfaces ground to 10-12 micro inches RMS. The opera-

tor merely loads the work, and presses a button to start this fully automatic cycle.

Rough Superfinishing on the .393" left bearing begins, with the part rotating at 350 r.p.m. Then the speed changes to 1000 r.p.m. for finishing. Completing this surface, the head rises automatically, moves to the right and comes down to repeat the operation on this second bearing.

Finally, the head moves up again, part rotation and stone oscillation cease—and the automatic operation is completed. Both bearing surfaces now measure 3-5 micro inches RMS. Floor-to-floor time is just 35 seconds.

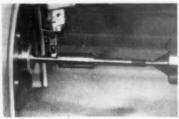
With Superfinishing, service life of these parts will be 4 or 5 times longer because the vital bearing surfaces are free from smear metal, chatter marks, grinder flats, etc.

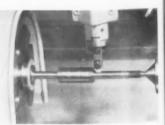


Special Model 50 used for Superfinishing bearing surfaces of fanshaft rotors.

First Superfinishing is an left bearing surface. Head then rises and moves to right to do second bearing surface. In this quick inexpensive operation, the two bearing surfaces are brought down from 10-12 micro inches RMS to 3-5 micro inches RMS. Superfinishing pays!

Write for book "Wear and Surface Finish."





No. 5-652

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

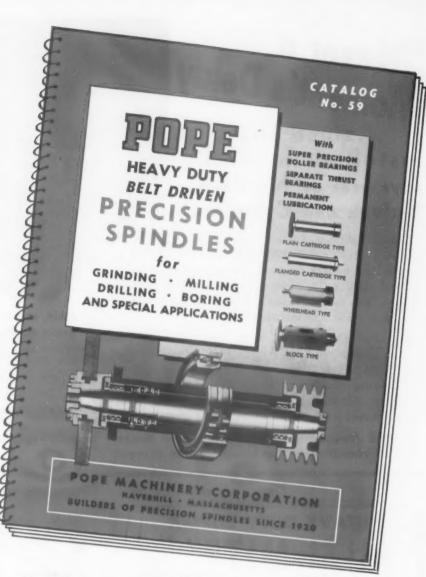
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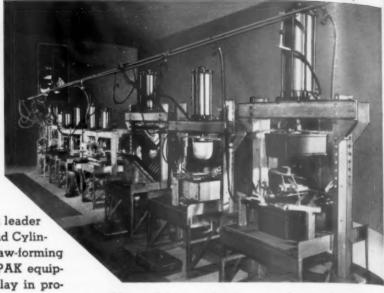
Never a Moment's Delay

...since first installed in 1945" says user of NOPAK Valves and Cylinders

Regal Plastic Co., Kansas City, Mo., . . . a leader in its field . . . installed NOPAK Valves and Cylinders on a battery of presses used in draw-forming sheet plastics. They report that this NOPAK equipment "has never caused a moment's delay in production since first installed."

The chief requirements of this application are medium power combined with flexibility in set-up and in stroke length. Downstroke of the press, controlled at varying speeds, is followed by a dwell of 1 to 20 minutes and careful withdrawal of the punch from the finished part.

NOPAK Air-Cylinder Power has provided the required versatility, in that set-ups can be changed



quickly, and fast application or release of pressure is easily accomplished.

For Technical Data on NOPAK Valves and Cylinders, write for Bulletin SW-1, or refer to Sweet's File for Product Designers,

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Poke him off balance with your left, then let him have it with your right. That's good boxing and, in the setup pictured here, good dust collecting.

DUST COLLECTOR

on this commutator grinder a problem of turbulence and heavy dusts was solved with a Torit No. 84 Dust Collector and dual hooding. Here the lower hood sort of pokes the dust off balance so it's a sucker for the one on top... and dust no longer prevents accurate turning of the commutator.

Torit has been solving dust problems like this for forty years. Our experience and know how are at your command . . . so bring your dust problems to—

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The sturdy and efficient door fastener used on Torit cabinets is available for use on your own products. Strike plate either flat or angular. Write for quantity prices.

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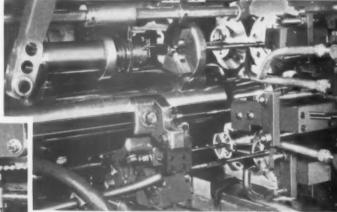
Torit Door Fastener

Although certain types of shaft jobs offer natural opportunity as bar machine work, with the exception of the CONOMATIC, seldom do they appear on multiple spindle bar automatics. In general, shaft jobs require a longer tooling area than do other types of bar work.

A glance at the frame design of the CONOMATIC explains why its tooling area is longer* than the tooling areas of other "automatics." And there are more tool positions* and more room* for tool setting for any type of job.

*You can have the figures

THERE'S More THAN JUST "Elbow Roos



Rear Side of Tooling Area



Front Side of Tooling Area



The length of the tooling area of the 1%-SIX, in which both of the above pieces were machined, is 431/2 ins. from spindle nose to gear box wall. The tooling length of the main end slide is 26% ins., and the total length is 31% ins.



A Comparison of ALL Automatics is in favor of Cone



HOLE Engineers please note



Each of these molded plastic fishing lures is drilled with five tiny odd-angle holes. With a drill press and tumble jig, an efficient workman can drill about 800 lures, 4,000 holes a day.

By contriving an inexpensive fixture with Keller Airfeedrills the same workman now drills 8,000 lures, 40,000 holes a day . . . produces ten times as much!

Are you familiar with this remarkable tool? A new illustrated Bulletin will be mailed gladly on request.

These are some of the features of Airfeedrills:

- · Assures accurate holes without costly fixtures . . . can be used with existing jigs
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- · Operates and is controlled entirely by with pneumatic cycling to speed production, reduce operator fatigue
- Small size permits it to be used on close centers and in tight places
- Accurately drills parts too large for conventional drilling machinery
- Wide range of speeds and strokes will accommodate light or heavy metal, wood, composition, plastic
- · Lightweight portable and stationary models are readily adapted to changing job requirements . . . quickly shifted
- from job to job



KELLER Pneumatic Tools

T O O

AUSH 2-WAY HORIZONTAL "HEAVY-DUTY" HYDRAULIC MULTI-SPINDLE DRILLING MACHINE PERFORMS 92 DIFFERENT OPERATIONS ON REO "GOLD COMET" CYLINDER HEADS.

Note two (2) cylinder heads are being machined simultaneously. Operating efficiently to deliver 35 cylinder heads per hour, this Baush unit shows consistently uniform production at high speeds.

UPPER STATION - Top Side

Drills (12) push rod holes $\frac{1}{2}$ way thru. Drills (12) valve guide holes thru.

- Bottom Side

Drills (12) stud holes 1/2 way thru. Counterbores (3) intake and (3) exhaust valve seats. Counterbore-drill (2) outer clean out holes.

LOWER STATION - Top Side

Counterbores (12) valve spring washer seats. Drills (14) stud holes thru (to meet).

- Bottom Side

Drills (12) push rod holes thru (to meet). Core drills (2) center clean out holes.

Reams (2) outer clean out holes.
Counterbores (3) intake and (3) exhaust valve seats.

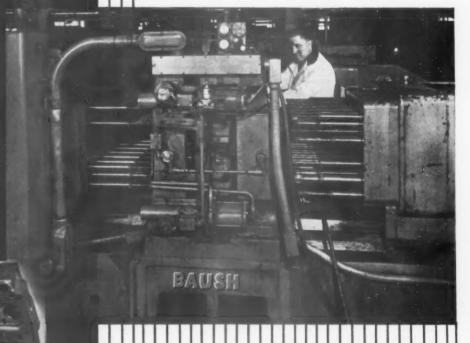
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Drives.



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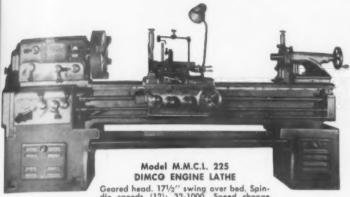
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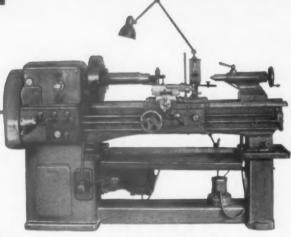
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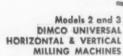
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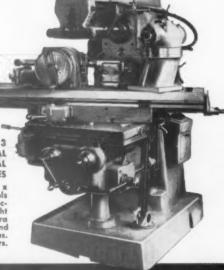


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An IDLE man at a BUSY



automatic spells profits »» a BUSY man at an IDLE

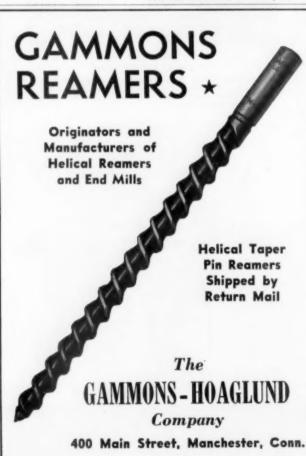
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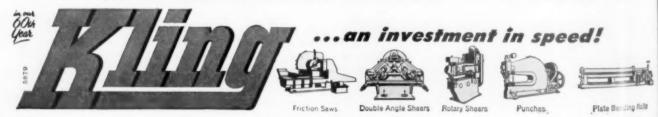
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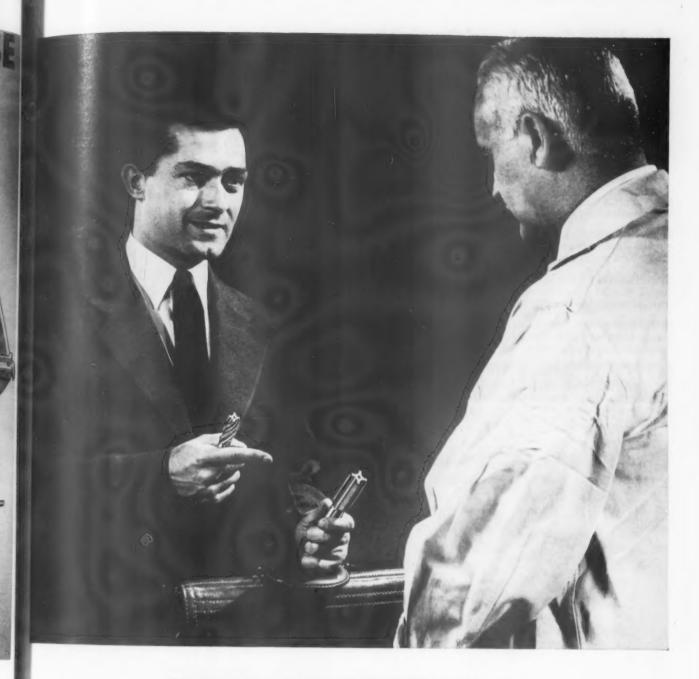
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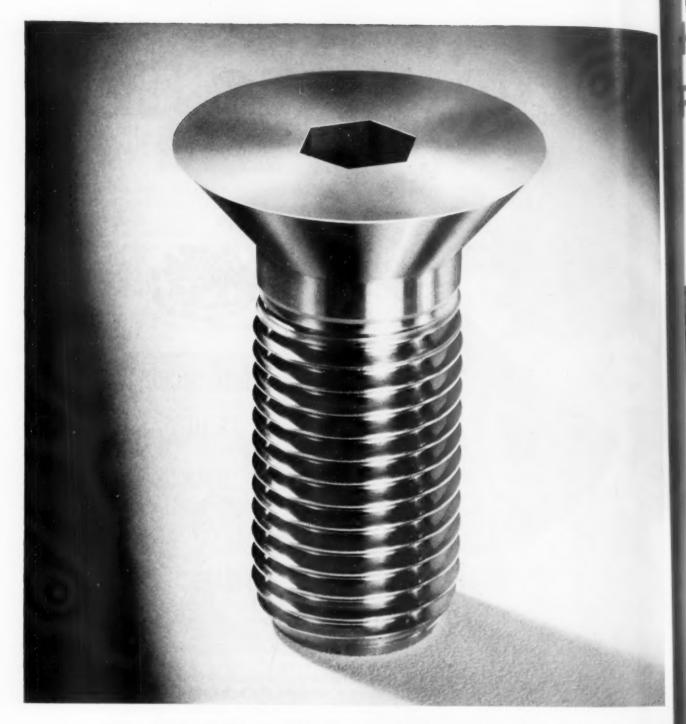
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For assembling THIN-SECTION MATERIALS UNBRAKO FLAT HEAD SOCKET CAP SCREWS

Precision made to Class 3 fit, these Unbrako screws have maximum head contact, flush surface assembly, non-slip internal wrenching, high shear and tensile strength. Write for descriptive literature. Standard Pressed Steel Co., Jenkintown 37, Pennsylvania.

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UNBRAKO SOCKET SCREW DIVISION CAP SCREWS - SET SCREWS - SHOULDER SCREWS - DOWEL PINS - PRESSURE PLUGS

HO V 3 COMPANIES STEPPED-UP PRI DUCTION, CUT COSTS - WITH Delta Multiple-Spindle PRILL PRESS





AT WEBSTER ELECTRIC COMPANY RACINE, WIS.

This four-spindle set-up of Delta 14-inch drill presses is used to drill and tap phonograph needle chucks at the rate of 125 units per hour, representing an important saving in time and production cost. Set-up time has been reduced to a minimum by bolting fixtures for the entire sequence of operations to a special removable plate laid on the drill press table.

AT SKILLMAN HARDWARE MFG. CO. TRENTON, N. J.

Final operations on the escutcheon or face-plate of a door lock are performed by four Delta 14" drill presses, as follows: (1) drill a 1½" cylinder lock hole; (2) drill ½" door-knob hole; (3) ream the ½" hole; and (4) four small attaching-screw holes drilled and countersunk. Every set-up of two or more Delta drill presses boosts production, says management. production, says management.

AT KARL LIEBERKNECHT, INC. READING, PA.

Four Delta 17" drill presses drill, tap, body drill and countersink 60 %2" holes in a bar member of a 32-ton knitting machine. Capacity is 17 bars per 8 hours. No special set-up man is needed—operators find it leasier and much quicker to do it themselves, make set-ups or change-overs in a few minutes. Delta equipment is said to pay for itself in about two years.



These and scores of other time-saving, cost-cutting set-ups of Delta multiplespindle drill presses were devised by the users—ample proof that you can do the same. Delta sectional tables allow easy set-ups of any number of drill heads

Why not survey your own machining operations? Your Delta dealer can help, with a wealth of data as to how others have solved problems similar to yours. He's listed in the Classified Directory under "Tools."

There's a Delta Power Tool for Your Job-WOOD OR METAL WORKING

53 Machines • 246 Models • More Than 1300 Accessories

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MANUFACTURING COMPANY

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- increased production
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- · wider range of work
- LOWER COSTS

Here's an all-hydraulic controlled tracer with a DUAL PURPOSE . . . for tracing from round or flat template and regular lathe work with unlimited range for both.

Note how simple: just position one lever on clutch and brake unit to engage or disengage the tracer . . . that's all. No loss of time, no extra space, no parts to bother with, no extra expense for a single-purpose tool.

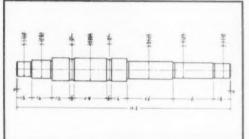
ABSOLUTELY SAME PRECISION ACCURACY AS WITH ALL SIDNEY PRODUCTS. Contour changes of the master piece are transmitted through the ultra-sensitive tracer valve as magically as if by an "electric eye"... even sharp shoulders are faced to amaxingly close limits.

ADD the Sidney Fluid Tracer to any Sidney Model 32 Lathe. You'll enjoy the savings and efficiency of

THE FINEST TURNING TOOL EVER PRODUCED

Please write for detailed literature or contact your nearest Sidney representative.

AMAZING SAVINGS THROUGH SIDNEY TURNING TIME



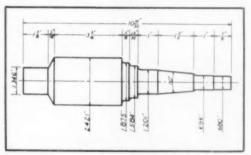
Normal Turning Time 4 hrs. 33 min.

SIDNEY TURNING TIME

3 hrs. 55 min.

38 min

YOU SAVE



Normal Turning Time 25 min.

SIDNEY TURNING TIME

2 min. 31 sec.

YOU SAVE

22 min. 29 sec.

26-93

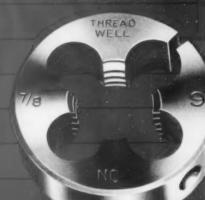
The SIDNEY MACHINE TOOL Company U.S.A. OHIO

164

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-164

The Tool Engineer

Threadwell TOOLS



Greenfield, Mass., U.S.A.



TABLE OF SPEEDS - Machine Screw Taps

MACHINE SCREW NO.	0	1	2	3	4	5	6	8	10	12	14
DECIMAL	.060	.073	.086	.099	.112	.125	.138	.164	.190	.216	.242
FEET PER MIN.				REV	OLUTIO	ONS PI	ER MIN	NUTE			
20	1273	1046	888	772	682	611	554	466	402	354	316
25	1592	1308	1110	965	853	764	692	582	503	442	395
30	1910	1570	1332	1157	1023	917	830	699	603	531	474
35	2228	1831	1555	1350	1194	1070	969	815	704	619	552
40	2546	2093	1777	1543	1364	1222	1107	932	804	707	631
45	2865	2355	1999	1736	1535	1375	1246	1048	905	736	710
50	3183	2616	2221	1929	1705	1528	1384	1165	1005	884	789
55	3501	2879	2443	2122	1876	1681	1522	1281	1106	973	868
60	3820	3139	2665	2315	2046	1833	1661	1397	1206	1061	947
65	4138	3401	2887	2508	2217	1986	1799	1514	1307	1149	1026
70	4456	3663	3109	2701	2387	2139	1938	1630	1407	1238	1105
75	4775	3924	3331	2894	2558	2292	2076	1747	1508	1326	1184
80	5093	4186	3553	3086	2728	2445	2214	1863	1608	1415	1263
85	5411	4448	3775	3280	2899	2597	2353	1980	1709	1503	1342
90	5730	4709	3997	3472	3069	2750	2491	2096	1809	1592	1421
95	6048	4971	4219	3665	3240	2903	2630	2213	1910	1680	1499
100	6366	5232	4442	3858	3410	3056	2768	2329	2010	1768	1578
110	7003	5756	4886	4244	3751	3361	3045	2562	2211	1945	1736
120	7639	6279	5330	4630	4093	3667	3321	2795	2412	2122	1894
130	8276	6802	5774	5016	4434	3973	3598	3028	2613	2299	2052
140	8913	7325	6218	5402	4775	4278	3875	3261	2815	2476	2210
150	9549	7849	6662	5787	5116	4584	4151	3494	3016	2653	2368

Threadwell

Threadwell Tools do many jobs



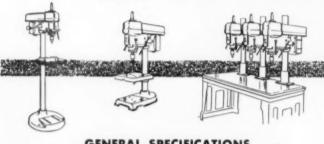
they can do y<u>our</u> tough ones

THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.



For fast, accurate drilling at new low levels of investment and production costs

> **NEW WALKER-TURNER** 15" Production DRILL PRESSES



GENERAL SPECIFICATIONS

SPINDLE TRAVEL: 414" or 6".

FOUR SPEEDS: 600, 1250, 2440 and 5000 R.P.M. with 1740 R.P.M. motor.

CAPACITY: Bench Models—12" chuck to table, $17\frac{1}{2}$ " chuck to base. Floor Models—39%" chuck to table, 46" chuck to base. All models $7\frac{1}{2}$ " center of chuck to column.

CHUCK: #6A Jacobs key type capacity 0 to 1/2".

TABLE: 10" x 121/4" machined working area.

BASE: 10" x 9" machined working area on Bench Models. 11" x 9" on Floor Models.

SPINDLE: Six spline full floating type, 56" diameter, male \$33 Jacobs taper for No. 6A Jacobs Chuck, or #1 Morse taper socket (optional).

PULLEY: Straddle mounted on two ball bearings for extra rigidity. New upper mounting permits quick belt changing.

COLUMN: Ground seamless steel tubing, 2¾" in diameter.

The specifications give you some idea of the capacity, wide range of speeds, and up-to-the-minute engineering of the new Walker-Turner 15" Production Drills. When you see these machines in operation ... note how readily they can be mounted in-line, for simultaneous drilling operations, you'll have a better idea of their accuracy and flexibility.

But it's only when these drill presses have been installed in your plant that you can appreciate how Walker-Turner design cuts drilling costs and increases productive efficiency. 72 different models, to meet practically every drilling requirement. Drill heads adaptable to hundreds of diversified uses.

SOLD ONLY THROUGH AUTHORIZED DISTRIBUTORS

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TRECKER CORPORATION KEARNEY AND PLATNEIELD N. J.

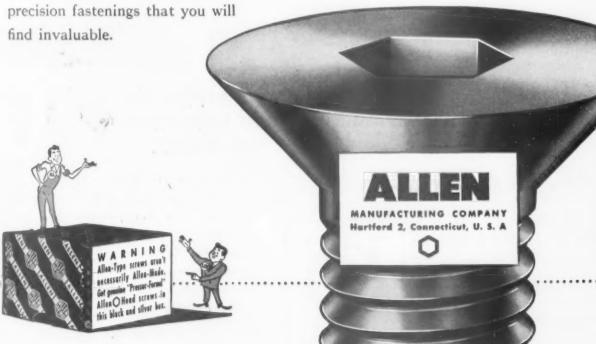
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Ball Bearings give independent pulling mounting. Relieves spindle from all belt tension # 0" to 12" Jacobs Chuck on \$33 taper Spindle mounted on 2 Ball One One mounted on 2 Ball step pulley e-piece head spine spindle JOINTERS RADIAL DRILLS
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 SPINDLE SHAPERS The Tool Engineer



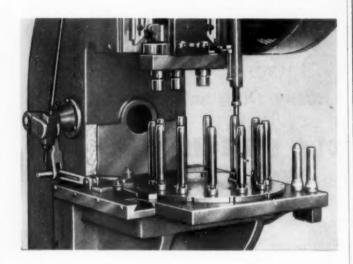
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300% More **Production Per Press** with V & O Dial Feed



This production increase was obtained by the Blake Manufacturing Company, Clinton, Mass., on a pointing operation on flashlight cases. Under the old method, Blake employed two presses and two operators for this job. Pieces completed by the two men averaged 32 per minute, or 16 per man. With the V & O Dial Feed, one man operating one press produces 48 per minute, for an increase of 300% in per press production. It was also possible to add a third operation to improve the finish of the case and reduce rejects.

The Dial Feed designed and built for this manufacturer is typical of the tooling available at V & O. More and more manufacturers have come to realize that automatic dial feeds boost production rates, conserve manpower and greatly simplify operator motions. V & O does the complete job for you on Dial Feeds, from initial design through manufacture. You get a complete package.



DESCRIPTIVE CATALOGS Catalogs containing complete specifications and operating details on V & O Precision Power Presses and Feeds are available. Please write The V & O Press Company, 391 Union Turnpike, Hudson, N. Y.

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Division of Emhart Mfg. Co.

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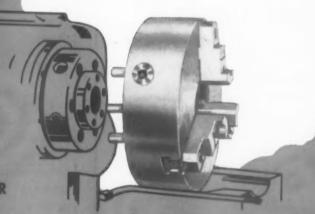




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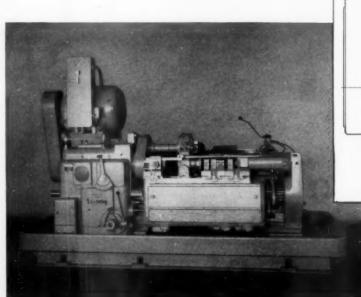
Cushman also manufactures

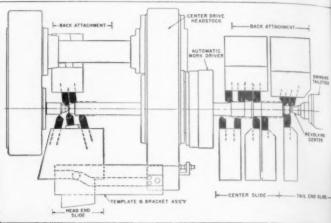
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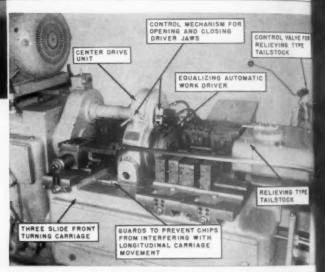


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Problem: Turn, face and chamfer simultaneously both ends of Rear Axle Drive Shafts.

Solution: The Model AR Lo-swing Lathe selected for this job is equipped with a Heavy-Duty Center Drive Unit fitted with an equalizing automatic work driver having three jaws. This design provides an efficient method of supporting as well as driving the shafts. The work driver is opened and closed with an air-operated rack which revolves the pinion fitted to the work driver as illustrated below.

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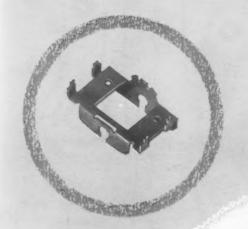


The line drawing, above, shows the tooling supplied for the machining operation; the dotted lines indicating the approximate amount of material removed from the forgings. The front turning tools all cut simultaneously, and the rear tools, mounted on two automatic back squaring attachments, are timed to complete the finishing of the shoulders five seconds after the front turning tools have ceased cutting. This assures accurate dimensions and excellent finish.

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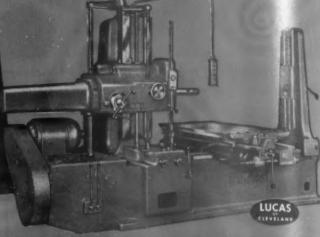
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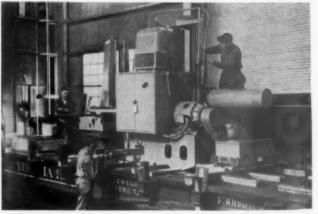
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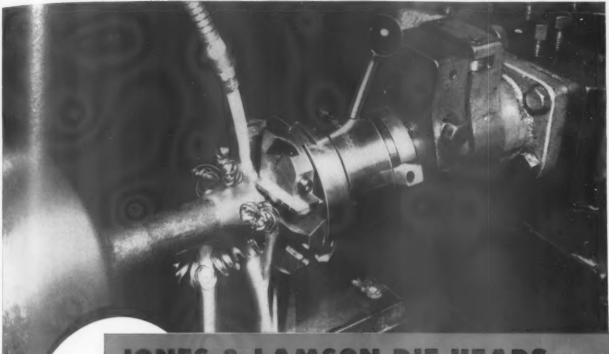
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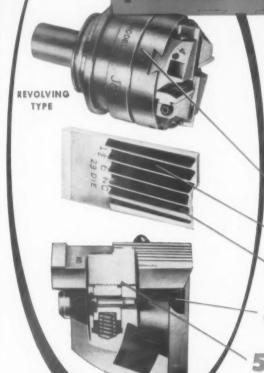
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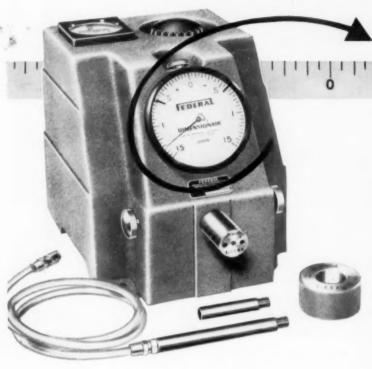
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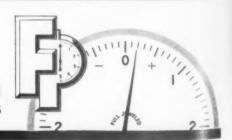


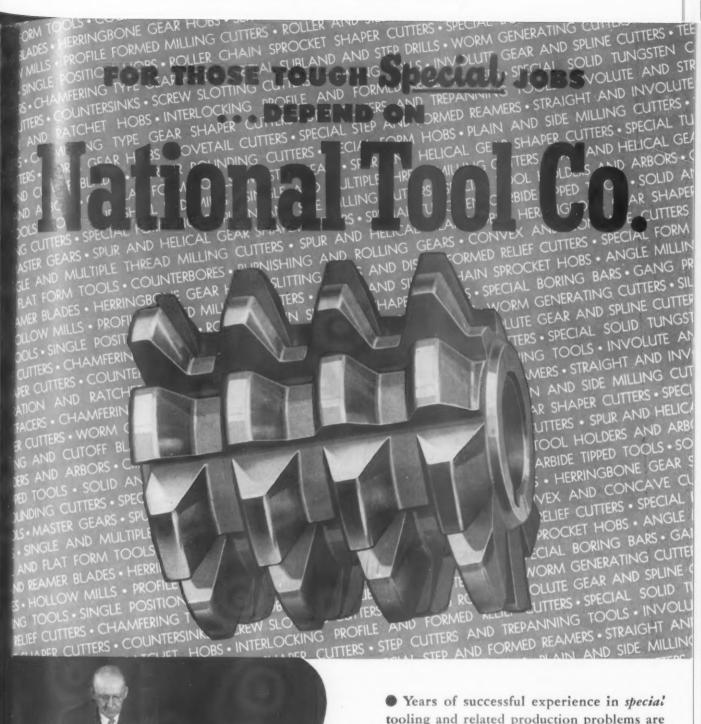
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National
TOOL CO.
Cleveland 2, Ohio



INPA Order M-103 of March 13, 1952

M-103-DIAMOND GRINDING WHEELS

This order is found necessary and ap-This order is found necessary and appropriate to promote the national defense and is sused under the authority and the production are amended. In the formula-

M-103 severly restricts the use of diamond wheels by: 1) limiting offhand rough grinding and finishing with resinoid bonded wheels, 2) curtailing inventories to 60 day periods, 3) requiring the use of coolant on all diamond wheel grinding, 4) allowing a maximum of 1/4" depth of diamond and 100 concentration on all wheels.

by the Defense Production Act as amended. In the formula-as amended in the formula-this order there has been con-the industry, representatives. This regulation will impose no real hardship if you specify ADAMAS preformed blanks because:

* Careful and accurate preforming to close tolerances assures minimum stock removal.

Additional advantages are:

- * Labor savings... fewer man-hours required for grinding.
- * Minimize breakage...eliminates danger of cracking as a result of overheating.
- Conservation... precious diamond wheels are saved for really important finishing jobs.
- ★ Economy...preforming is done inexpensively by ADAMAS in soft material saving you costly wheels.

Delivery of ADAMAS preformed blanks is now scheduled to help in this shortage. An inquiry will quickly demonstrate speed of delivery and economical pricing. If ADAMAS standard blanks fit your requirements, they can be obtained immediately from stock.

list for order	ng standa		log and p special to	
Name				
Title	********	******	********	
Campany	*******		******	
Address				

finish.

(g) "Finish grinding" means the final
grinding to desired size and finish.

(h) "Profile grinding" means grinding
to a predetermined shape ans grinding
a form or template
(i) "Wet srinding" means a method
whereby a flood of coolant or lubricant
work.

"Wick grinding" means a whereby a sufficient quantity of coolant or Jubricant is supplied to a wick in such wheel adequately wet.

PRODUCERS OF TUNGSTEN CARBIDE TOOL TIPS, DIES AND WEAR PARTS



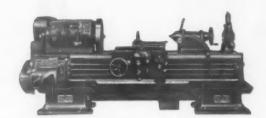
REPLACE

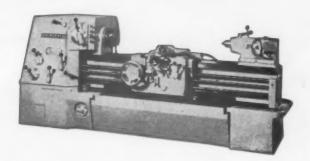
SPRINGFIELD

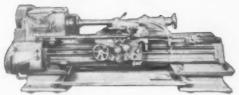
LATHES

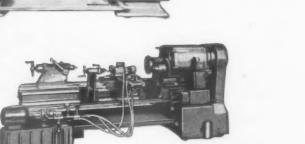
handle a wider range of work-

increase output —
lower operating costs

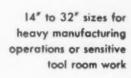








TURNING
CONTOURING
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THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO &

Exclusive Representatives in All Principal Cities

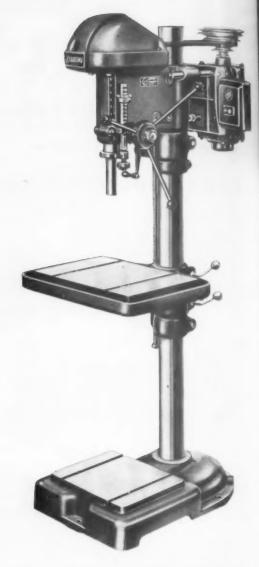


18" HEAVY DUTY DRILL PRESS

With 6 "Bonus" Features For Better All-Around **Heavy Duty Drilling**

- ★ Head and Table Positioning Mechanism
- ★ 61/2" Spindle Travel
- * 39" Maximum Distance Spindle to Table
- ★ 63/64" Spindle, No. 3 MT Nose
- ★ Vernier Depth Stop Control
- ★ Ball Bearing Drive

Get these important new drilling advantages with a Clausing 18" Drill Press. The 61/2" spindle travel gives bigger job capacity, permits better use of production chucks. There's 6" to 13" more capacity from spindle to table. Spindle is bigger, stronger — handles larger tools. Exclusive vernier control provides .001" depth accuracy. Positioning mechanism saves set-up time—moves both head and table. Massive construction, precision-machining throughout, and the smoothness of 5 ball bearing races insure exacting accuracy on every operation. Contact your Clausing distributor, or write for catalog.

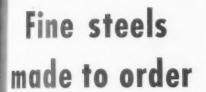


AND ALL THESE OUTSTANDING **CONSTRUCTION FEATURES TOO!**

• Drills to center of 181/4" Circle • Drills 3/4" in Steel, 1" in Cast Iron • 13" x 18" Production Oil Table • 12" x 14" Precision-Ground Base • Hinged Motor Support Base • Adjustable Feed Tension • Double Coordinate Locks on Head and Table . Massive Construction and Precision Machining.

CLAUSING DIVISION

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No matter what type of special steel you order from Jessop . . . whether it be tool steel or saw steel, stainless clad or flat stock . . . you can buy with confidence knowing that it has not been picked from warehouse stock. Fine Jessop steels are tailored to your specific need. There's another thing you can be sure about when you order from Jessop. You'll get good service. Youthful, revitalized Jessop wants your business. The entire organization will work hard to bring you the degree of satisfaction that will make you a permanent customer.

HIGH SPEED STEELS - HIGH SPEED BITS - PRECISION GROUND
FLAT STOCK - HIGH SPEED AND ALLOY SAW STEELS - HOT
WORK DIE STEELS - COLD WORK DIE STEELS - CARBON AND
ALLOY STEELS - STAINLESS AND HEAT RESISTING STEELS
YALVE STEELS - STAINLESS-CLAD STEELS - CAST-TO-SHAPE
STEELS - COMPOSITE TOOL STEELS - ARMOR PLATE

ESSOP

STEEL COMPANY . WASHINGTON, PENNSYLVANIA

Specify

American

Broaches

For the best results
use American broaches
—whether you broach
keyways or drive gears.

BROACHING MOTOR COUPLINGS WITH AN AMERICAN STANDARD KEYWAY BROACH

A simple operation yet requiring accuracy is the production broaching of keyways in motor couplings.

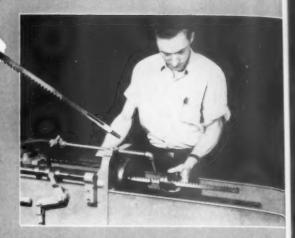
In this tooling set up the operator is not required to remove the American keyway broach from the pull head as he threads the part over the broach onto a work horn. High production is obtained as a part is loaded on each return stroke.

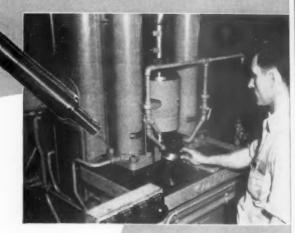
Whether your problem is keyways or complicated involute splines, American broach engineers can design the proper broach to produce parts to your requirements.



The prime requirement of automatic gears is silence in operation and long life. American broaches are used to finish the drive gear's helical involute teeth on the American machine shown to the right. No further internal machining is necessary on these gears which must pass rigid tests before final assembly.

Let American quote on your broaching requirements — machines, broaches and fixtures. Send a part print and full information.





COMPLETE BROACHING INFORMATION

Over 5,000 copies of Catalog 450 have been distributed . . . get your copy now of this informative data book on American Broaches. Photographs . . . drawings . . . charts and case histories of broaching tools. Write today for your copy!





ANN ARBOR, MICHIGAN

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

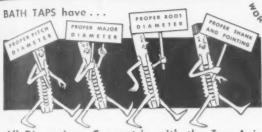




Susie Brown—at sweet sixteen
Was the perfect farmer's daughter.
One day a travelling salesman called—
Said things he hadn't ought-er.



T'was then her fella—Elmer, Tapped the "slicker" with a "whopper" Which proves it's hard to cut much ice With a "pitch" that isn't proper!



All Dimensions Concentric with the Tap Axis

Bath Tap dimensions are precise— Concentric to their axis. Will cut your threads to perfect size— As sure as death and taxes!



And so, in mass production— To avoid a "knock-out" blow. Taps must always be in proper pitch To keep the work in flow.



MANAMANANA MANAMANA

MATH DO GROUND FROM THE SOLID

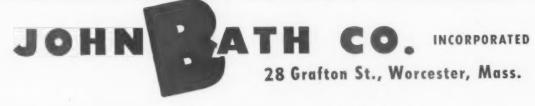
INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

Bath Taps always have the "right pitch" because all dimensions are "controlled". Pitch diameter, major diameter, root diameter, shank and pointing are concentric with the axis of the tap. When the pitch diameter has been determined—the same identical Bath ground thread taps can be duplicated at any time, with perfect uniformity. The reason—all dimensions are controlled by

grinding while the tap is mounted on center holes — and these center holes are ground after the tap is hardened.

A wealth of material from past tap manufacturing experience . . . data on design, heat treatment and performance — enables us to help you solve your "threadaches". Ask our Bath engineers to serve you NOW!

PLUG AND RING THREAD GAGES . GROUND THREAD TAPS . INTERNAL MICROMETERS







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for peak performance

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POWER BLADES



Every Barnes Power Hack Saw blade is individually Rockwell tested to assure you the fine quality for which Barnes blades are famous.

> Your Industrial Distributor will help you select the best blade for your job.

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Rotary, Index, Milling Table



Now \$

Turns Your DRILL PRESS Into A VERTICAL MILLER

Think what this will mean in your shop! Can be used on any Drill Press, Lathe or Milling Machine and provides what is practically a universal milling machine.

Designed for use in all types of metal and woodworking shops. A precision table permitting fine work to close tolerances. It is accurate, speedy, well constructed and attaches quickly in a firm position.

Rotary feed calibrated in degrees; Cross feed in thousandths; Dual Cross Slide with cross feed 2½" each side of center or 4½" overall. Has acme thread cross feed screws, adjustable gibs on cross slides. 40 to 1 worm and gear ratio in rotary feed. Equipped with bolt slots and locking screws. No. 83 Table Dia. 8", T-Slots ¾", Base Keyway ¾", Base Dia. 6¼", Ht. 5", Wt. 37 lbs. Price Only \$54.50. Other Types available, No. 82 Dual Cross Feed only \$43.75; No. 86 Rotary Feed Only \$46.75.

Order Today! If dealer can't supply, write us. Ask for Circular No. 10

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- Easy and quick adjustment. No special tools required.
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- Simple in design. No complicated mechanisms.
- Heavy chasers for greater strength. Chaser threads precision ground.
- All parts hardened and ground and precision fitted.

Send for full information on this new improved Modern Collapsible Top and its cost reducing possibilities applicable to your tapping

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CONSOLIDATED MACHINE TOOL CORPORATION
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Introducing



The NEW Columbia No. 2 Vertical Milling Machine

The success of the Columbia #1 Milling Machine has encouraged its producers to introduce a new, more versatile mill, The NEW #2 incorporates all the advantages of the #1 plus many NEW features.

For full details, write for NEW 4 page Illustrated Catalog.

Columbia's #2 Vertical Mill helps relieve bottleneckscuts shop costs and increases production.

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- mond.

 Adjustable to three ranges of degrees.

 Generates a definite and consistent sharp point.
- Eliminates burnt or shattered Dia-monds.
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Ask your Representative about other amazing advantages of Citco Hydraulic Turners and Diamond Tools,

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Cleveland 17, Ohio



V-Model Wood Base Table

Mayline wood base tables now have solid basswood tops with steel end cleats. Substantial wood base boasts heavy oak uprights.

The "V" construction of this table eliminates cross braces between uprights, producing a table both strong and neat in appearance. Positive tubular tilting units securely hold top at any angle. Sizable hand knobs lock table at any height. This is a very serviceable table that meets the requirements of any drafting room.

Write for further details about this and other fine Mayline drafting room furniture and equip-

Products distributed nationally through dealers.

ENGINEERING MANUFACTURING CO.

611 North Commerce St., Sheboygan, Wis. MAYUNE

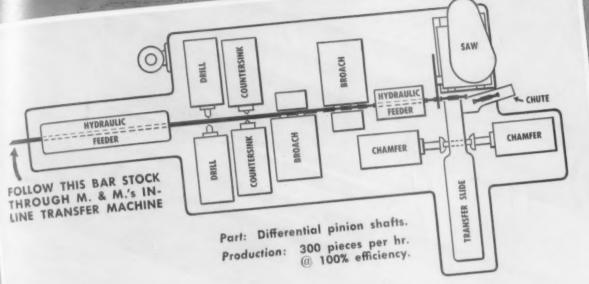


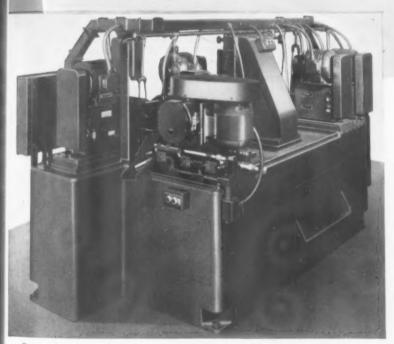
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The Tool Engineer

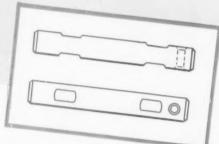
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MOTCH & MERRYWEATHER Automatic IN-LINE Transfer Machine





Save time and floor space by combining operations.



• Many machining operations are combined on an M. & M. progressive IN-LINE automatic transfer machine. Stock is held motionless. Most of the operations are performed on a length of solid bar stock prior to cutting off. Using the progressive in-line principle, we can design a production machine for your individual requirements. Odd-shaped extrusions present no machining problem.

Send us your parts drawings.

Manufactured by _

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO

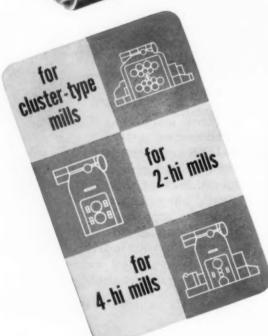
ders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT









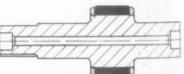
· Here's the magic key to improved surface finish, more uniform gauge and closer tolerance on all types of cold-rolled metal strip. Whether you require an ultra-mirror finish or just a plain, smooth surface—work rolls of Talide (Tungsten Carbide) are the answer. Only Metal Carbides has the know-how and experience to produce carbide rolls from 1 pound laboratory size up to 1,000 pound production mill rolls.

Long-lasting Talide Rolls, made of the world's hardest metal, step up mill production and reduce scrap and rejects. They last 25 to 50 times longer between grinds, and can be reground twice as many times as ordinary rolls. They impart improved physical properties to the strip, reduce plating costs, and eliminate the need for subsequent polishing operations.

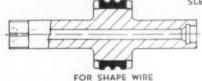
Over 50 mills are now using Talide Rolls for rolling cold-rolled, copper brass, stainless, spring steel. razor steel, alloys, carbons, aluminum foil, tinsel ribbon, flat and shape wire.

Talide Rolls are designed to help the metalworking industry produce more efficiently-in less time-at lower cost.

Send for Catalog CR-50



SLEEVED ROLLS FOR FLAT WIRE





CUTTING TOOLS . DRAWING DIES

OVER 25 YEARS EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



- Engineers at Arwood Precision Casting Co. use TOCCO Induction Melting Furnaces for melting and remelting quality steel. Other companies have found TOCCO equally adaptable for melting non-ferrous metals. No wonder! Look at the advantages:
- * Stepless power control
- * Extremely Rapid Melting
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- * Simple, Safe Operation
- * Clean, Comfortable Working Conditions

If any of these advantages suggest economies in your operations write for full details—no obligation, of course.

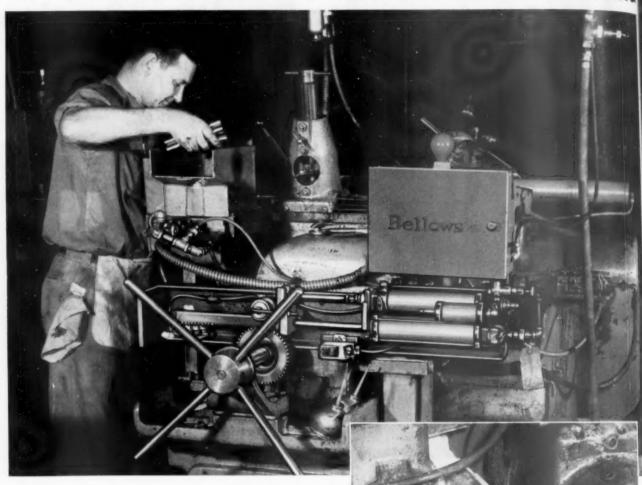
THE OHIO CRANKSHAFT COMPANY

NEW FREE
BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. G-5, Cleveland 1, Ohio
Please send copy of "The Case for TOCCO Induction Melting."

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AIR-POWERED INFEED GIVES 43% MORE PRODUCTION-BETTER QUALITY CONTROL—IN CENTERLESS GRINDING



CENTERLESS grinding is a critical operation. Infeeding by hand requires a keen eye, a sure touch, and an instinctive sense that comes only with years. Scrap runs high at best—and production... well you take what you get, and try to be happy about it.

But better production is possible. Try infeeding with Bellows "Controlled-Air-Power" and watch scrap drop. Add an air-powered work positioner and ejector and watch production rise. Put on a hopper feed, and see production jump as much as 40%.

We'd like to tell you more about Bellows "Controlled-Air-Power" and what it is accomplishing in setting new production records for centerless grinders . . . and for drill presses, milling machines and other machine tools.

Write for free Bulletins CL-30 and BGF-5A. Address, The Bellows Co., Akron 9, Ohio. Dept. TE452.

The Bellows Co.

Production in grinding a 57/64" diameter, 7" long counter gear shaft for the transmission of one of America's best known cars jumped 43% when Bellows "Controlled-Air-Power" went on the job. Scrap dropped to a new low. Operator fatigue was no longer a factor. (Protective covers removed for photograph.)



Gets the Bugs out of Drilling

TES, Standard Red Shield Drills do "get the bugs out" of drilling. Their uniform quality gives uninterrupted production, helps reduce costs.

For particularly tough jobs the advice of Standard Red Shield Service Engineers is always available without cost or obligation. These "Standard" men bring you the "Know How" gained in our 71 years' experience in the manufacture and use of metal cutting tools.

Call the Standard Red Shield distributor in your town for tools and service. You'll find an organization of substantial business men who are able and interested in you. It will pay to Standardize.



STANDARD TOOL (O. CLEVELAND 14, OHIO

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New York · Detroit · Chicago · San Francisco

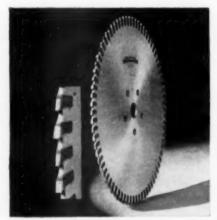
STANDARDIZE AND SAVE WITH STANDARD RED SHIELD METAL CUTTING TOOLS. STANDARD DISTRIBUTORS IN MORE THAN 500 CITIES CAN SUPPLY YOUR REQUIREMENTS.

Why run around in circles — to find the Right Circular Saw?

SIMONDS makes 'em al!!

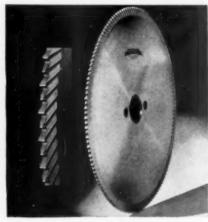
SIMONDS MAKES ALL THREE TYPES OF CIRCULAR METAL CUTTING SAWS. So you can be sure that SIMONDS will give you the right saw for your job . . .

for any type of machine. See your Simonds Distributor today.



INSERTED TOOTH

For heavy production cutting, Simonds I. T. Saws are tops. Alternating square and beveled teeth "tri-vide" chips for easy cutting and clearance. An individual wedge securely anchors and aligns each tooth in the tough saw plate. What's more, this saw has maximum clearance for cool, free cutting... will stand an extremely high rate of feed... and teeth can easily be replaced singly or in complete sets right in your own plant by anyone of average mechanical ability.



SEGMENTAL

Where you require a finer tooth saw or especially smooth cuts on production work, this is your saw. Long-lived high-speed steel toothed segments are securely held in a tough alloy steel plate by a special tongue and groove design. Teeth are alternately square and beveled for easy cutting and clearance of "tri-vided" chips. Simonds special grinding provides ample clearance directly below the cutting points, insuring free, cool operation under all conditions. Sharpening can be done on any automatic grinder.



SOLID TOOTH

Clearance ground and furnished in High Speed, Si-Maloy (Parented), or Semi-High Speed Steel, Simonds Solid Tooth Saws are recommended for general shop cut-off requirements, for use on smaller automatic cut-off machines and for cutting operations where kerf is an important factor. Tooth design is determined by and especially suited for the application. Simonds' own steel, plus skilful heat treating and accurate grinding, insure long, dependable, trouble-free service.



SIMONDS SAW AND STEEL CO.

Factory Branches in Boston, Chicago, San Francisco, and Portland, Ore. Canadian Factory in Montreal, Que.



This starter switch for a refrigerator motor presents a tough assembly and inspection problem. The springs must be accurately bent and adjusted by hand—tolerances are close.

With the Kodak Contour Projector the whole operation—bending and checking—may be done at the same time and under the magnification that's most convenient.

Since the Kodak Contour Projector has provisions for surface illumination from the same lens that picks up the image, every detail of the switch is shown on the screen. A 45° mirror permits the part to be mounted flat for easy accessibility. Both to adjust the part and check tolerances, the operator simply compares the magnified image with a chart-gage laid on the bright screen.

Whether your interest is in large parts or small

parts, simple parts or complex parts with many dimensions, a Kodak Contour Projector will do the job quickly, completely, and accurately. The operator can work in a lighted room unhampered by hoods or curtains. And little training is required to get the work out in a hurry.

For rapid, routine inspection and adjustment work, the economical, stripped-down Kodak Contour Projector, Model 3, will meet your requirements. For toolroom measurement, the versatile Model 2A is what you need. In your area there is an experienced field engineer who will be glad to discuss your own particular problems. You can get in touch with him by writing Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

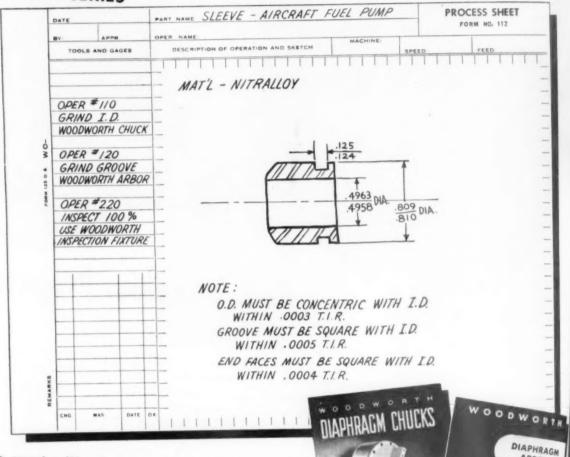
If you want to check precision spur and helical gears in action, write for information about Kodak Conju-Gage Instrumentation.

Kodak

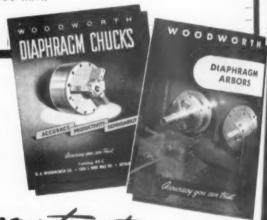
TODAY... it's WOODWORTH

FOR PRECISION CHUCKING

No. IN A SERIES

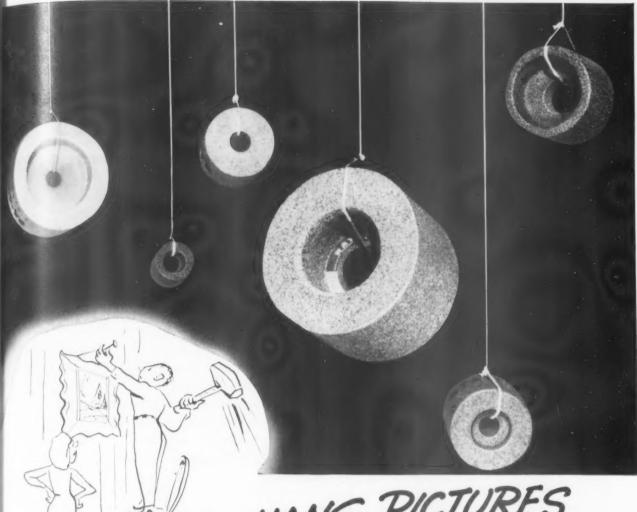


Across the country Woodworth is recognized as "headquarters" for the best in precision chucking. So, for the best solution to your precision chucking problem send part print and machining information to Woodworth.



Accuracy you can trust

N. A. WOODWORTH CO., 1300 EAST NINE MILE ROAD . DETROIT 20, MICHIGAN DIAPHRAGM CHUCKS AND ARBORS CONE-LOK JIGS



YOU COULD HANG PICTURES with a sledge hammer...

but . . . you shouldn't — nor should you use just any internal grinding wheel when you can use Bay State's . . . proven best in the field for the countless inside grinding jobs that call for speed and accuracy.

Deservedly popular, Bay State Internal Grinding Wheels are:

- UNIFORM due to exacting standards of manufacture
- TRUE-RUNNING because of accurate centering
- LONG-LASTING because they fit-the-job, through the proper selection of grit and grade. (That's where Bay State engineering experts will really help you.)

BAY STATE ABRASIVE PRODUCTS CO. Westboro, Mass.

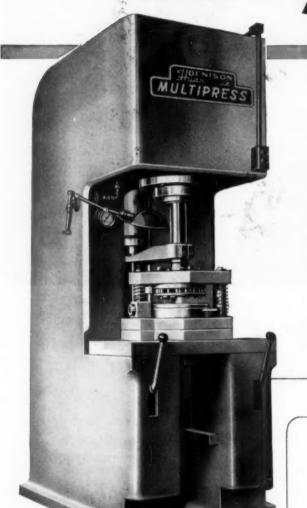
Branch Offices and Warehouses -Chicago, Cleveland, Detroit, Pittsburgh Distributors — All Principal Cities In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario

BAY STATE'S current expansion program includes a new 250 foot kiln plus a 30% increase in plant capacity ... this means better deliveries to



FOR FASTER PRODUCTION PLUS

OUICK CONVERSION standardize on MULTIPRESS



Wide-range adjustability of action makes Multipress the quick, high-production answer to an amazing variety of manufacturing needs - ordnance jobs included. This easy adaptability pays a bonus every time you switch from one type of operation to another - now or later. You can convert rapidly, for fast production and better results, when you standardize on Multipress equipment. And early deliveries on most Multipress equipment give you another break on your production planning.

Here are some available Multipress features that bring you these profitable advantages:

1. FULLY ADJUSTABLE:

Stroke Length Tonnage Ram Traverse Speed **Pressing Speed** Ram Dwell or Time Delay Ram Cycling (automatic) Single or Sequence Vibratory Ram Action

2. EASILY EQUIPPED WITH:

Multipress Index Table Feed **Multipress Dial Feed Tables** Multipress Harmonic Stock Feed Hopper Feeds Standard Tooling Fixtures

3. WIDE RANGE OF SIZES

8 Frame Sizes 11 Tonnage Capacities Interchangeable Power Units, Cylinder Assemblies and Control Valves

4. PLUS:

Good Deliveries

1 to 50-ton capacities

WRITE TODAY: for full details on the versatile Multipress and its wide range of accessory equipment.



The DENISON Engineering Company, 1191 Dublin Road, Columbus 16, Ohio



Be sure spindle and back plate run true.



Mount on adapter to facilitate changing wheels.



of n-

Maintain correct wheel speeds for bond types.



Grind wet whenever possible.



Dress wheels only when necessary.



Use Norton training films on carbide grinding and diamond wheel operation.

Tips on Diamond Wheel Operation That Will Lengthen Wheel Life and Cut Carbide Grinding Costs



...See How You Can Save On Many Jobs With The New K-Bond CRYSTOLON Wheels

Since the limited supply of diamond wheels can't meet the tremendous demand, it now is vital to make your diamond wheels last as long as possible. So remember:

In many applications — especially rough grinding — where you're now using diamond wheels, the new Norton K-Bond Green CRYSTOLON wheels will give you good results.

These faster, freer cutting silicon carbide wheels offer improved uniformity in cutting action. And the new vitrified K-Bond can be so closely controlled that wheels of half-grade increments of hardness are possible — enabling you to "pinpoint" specifications to your individual needs.

Norton CRYSTOLON wheels also are available in resinoid bond for finishing. Ask your Norton abrasive engineer for a recommendation.

To get maximum results from your expensive diamond wheel investment, be sure to investigate all the possibilities of supplementary grinding of your carbide tools with both bond-types of CRYSTOLON wheels. The chances are you'll find many new ways to save.

YOUR NORTON DISTRIBUTOR CAN GIVE YOU VALUABLE HELP

Besides his own practical experience with abrasive applications, your Norton Distributor can call in Norton Abrasive Engineers for additional expert aid in solving your grinding problems. Take advantage of the great store of Norton knowledge he makes available to you. See him for the right wheels to use in your carbide grinding.

GET THESE MONEY-SAVING FACTS

Together, these two fact-filled booklets can do a lot towards helping you cut your diamond wheel expenses while getting better results throughout the range of carbide grinding. Ask your Norton distributor for them. Or write direct for Forms 167 and 2241 to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.



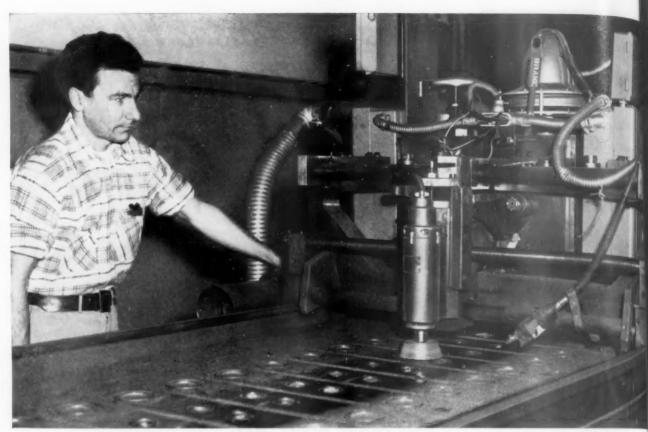


*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Making better products to make other products better

hio

ineer



Small Wheel Does a Big Job. Truing the 40 foot by 271/2 inch bed of a wing spar cap shaping machine with a Robertson Grinding Wheel,

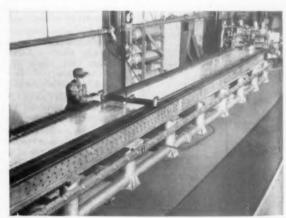
ROBERTSON GRINDING WHEEL SOLVES A BIG PROBLEM FOR CHASE AIRCRAFT

It was an ingenious machine which Chase built for shaping wing spar caps for the C-123 Assault Transport—but it brought up a big problem. To precision-shape the caps to the contour required, the machine bed had to be perfectly flat. The bed was chilled cast iron, 40 feet long and $27\frac{1}{2}$ inches wide. Truing such a large surface by grinding couldn't be done—the experts said.

But a Robertson Wheel, driven by a 1 hp motor, proved the experts wrong. The job was done right . . . and on time. The wheel used was a standard Robertson $4/3 \times 1\frac{1}{2} \times \frac{1}{2}$ Type 11. A small wheel for a big job. The average stock removed was .015 inch. True flatness of bed was achieved to an accuracy of .0025 inch.

It-couldn't-be-done jobs are everyday fare for Robertson Grinding Wheels.

They're precision built for the toughest jobs industry has to face. Prove it yourself. Blueprint your problem and let us recommend a wheel that will solve it.



Accuracy is the Axiom for Aviation Products. Checking the content
of a spar cap for accuracy.

ROBERTSON MANUFACTURING COMPANY TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels . Mounted Wheels . Segments



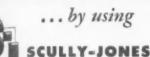
Complete Your Design Program ON TIME...











TOOL ENGINEERING AND DESIGN SERVICE

Take advantage of 40 years'experience:

For over 40 years Scully-Jones has been designing standard and special production tools. S-J Engineers have completed design programs for plants in the automotive, aircraft, instrument, home appliance, ordnance, farm machinery, machine tool, electrical and special machinery industries. This varied experience, accumulated through the years, qualifies our engineers to help you.

Save time and money with today's performance:

S-J Engineers know the latest machining and planning practices. Our first objective when designing your dies, fixtures, gages, jigs and cutting tools is to apply the design techniques which will help you get the low-cost, fast, accurate production desired. Evidence of our ability to perform is the development, introduction and acceptance of new cost cutting standard tools such as the S-J "Quick-Lock" Adjustable Adapter, Drill Stop, "JA" and "JT" Floating Holders, Pre-Setting Gages, "Roll-Lock" Mandrels, Arbors, and Chucks.

Use foresightedness for tomorrow:

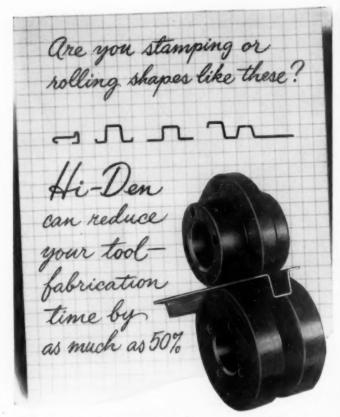
Eliminate the problem of creating or expanding your own engineering facilities. S-J Engineers work either in your plant or ours. Let some of our 70 Engineers help you complete your design and tooling program on time so you can get your new production going and keep it going.

Write or wire for further information

SCULLYSAND COMPANY YJONES

1915 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

HEADS AND HANDS TO HELP YOU SAVE TIME AND MONEY



A large aircrast manufacturer* reports HI-DEN rolls in a Yoder machine produced these short-run parts in stock sheared from sheet aluminum (in as-quenched condition) more satisfactorily and economically than other methods tested. And tool fabrication time was reduced 50%.

Another company* found that a steel draw die which formerly required three passes to complete a draw, when faced with HI-DEN completed the same draw in one pass. HI-DEN treats the metal better.

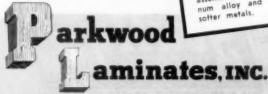
More than 100 different applications for HI-DEN have been reported by users . . . forming, stretch, draw and press brake dies; jigs, fixtures, templates, pressure pads and many others. Ideal for use in Hydro-form or Mar-form presses.

HI-DEN, a compreg of selection wood veneers impregnated with phenolic resin (laminated and compressed under extreme heat and pressure) is far stronger than equal weight in steel, is lighter in weight, easier to handle, resistant to oil, alcohol and moisture, dimensionally stable — and is easily shaped with standard tungsten carbide tools.

*Names on request

If you are forming light metal parts, HI-DEN has important advantages to offer. Why not send today for Technical Bulletin and literature showing how to improve quality while lowering costs?

HI-DEN's companion product, Parkwood 8000 (a kraft paper impregnated laminate) is becoming popular for bench tops . . . smooth, hard, but resilient, it won't burr and scratch assemblies of aluminum alloy and other softer metals.



32 Water St., Wakefield, Massachusetts

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EXTRA LONG LENGTH

VICTOR MACHINERY EXCHANGE, INC.

DEALERS IN TOOL ROOM EQUIPMENT
251-D Centre St., New York 13, N. Y.
Phone CAnal 6-5575

USE READER SERVICE CARD; INDICATE A-5-202-2



For the finest
COUPLING BOLTS
MILLED STUDS
CAP SCREWS
SET SCREWS

WHO is... WM. H. Ottemuller YORK, PA.

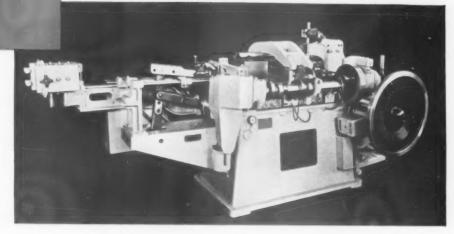
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USE READER SERVICE CARD: INDICATE A-5-202-4

The Tool Engineer

Eliminate Secondary Operations ——— Reduce Costs - - -



Blanking*
Piercing*
Trimming*
Swaging*
Coining*
Forming*

*Produce parts requiring any or all of these operations complete at one stroke of the U. S. Multi-Slide ® To meet competition today manufacturers must closely control costs. Secondary operations, inspections and handlings must be eliminated wherever possible.

In the production of precision formed stampings from coil stock, the U. S. Multi-Slide ® can effect substantial savings because it completes a finished part at each stroke of the machine. Many different types of parts which would ordinarily require costly secondary operations can be profitably produced. And since parts are produced complete—uniformly and to close tolerances—the number of inspections is also reduced.

The illustration above shows a typical part which is produced complete in the No. 33 Multi-Slide. This machine has a capacity for material up to $21/2^{\prime\prime}$ wide. If your program involves the production of precision stampings, investigate its labor-saving, time-saving features. Ask for a copy of Bulletin 15 containing complete specifications.



Trade Mark Reg. U. S. Patent Office

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange)

NEW JERSEY

Builders of U. S. Multi-Slides-U. S. Multi-Millers

U. S. Automatic Press Room Equipment-U. S. Die Sets and Accessories

HIGH PRECISION MACHINING INSERTED BLADE ECONOMY with



AUKESHA LITTING TOOLS

You replace only the blades in WAUKESHA Inserted Blade Tools. The tool body lasts for years; a great economy compared with solid reamers which must be completely discarded when the blades wear undersize. - WAUKE-SHA blades are adjustable so you maintain accurate diameters through grind after grind . . . Blades are made of the finest high speed tool steel - carbide tipped if you so specify.

WAUKESHA INSERTED BLADE REAMERS



WAUKESHA Long and Short Shank Standard Inserted Blade Reamers. These are made in standard cutting diameters from '3%" to 31/4". Special diameters are made to your requirements.

WAUKESHA QUICK CHANGE CHUCK

WAUKESHA Quick Change Chuck with Floating

Tool Holder. Shortest in overall length.

Small body diameter makes

close hole centers possible. Compensates at any point within

360° for misalignment up to .030".



WAUKESHA SPADE DRILLS



WAUKESHA Spade Drills with replaceable blades for deep hole drilling are much lower in cost than comparable solid twist drills. Shanks are made in any specified length.

WAUKESHA INSERTED BLADE COUNTERBORE

WAUKESHA Inserted Blade Counterbore.

Diameters of 1 1/4" to 4" are standard stock units. Pilots are interchangeable within





1428 ARCADIAN AVE. . WAUKESHA, WIS. USE READER SERVICE CARD: INDICATE A-5-204-1

Ruthman Gusher Coolant Pumps give you the right answer to better Coolant service. They're scientifically designed, precision built to give you top performance in your coolant systems.



There is no guesswork when you specify timetested Ruthman Gusher Pumps. You can get the model to fit your specific coolant system needs.



Our catalog details the information you'll need to pick the Gusher you require. Write for it today.



OF BETTER COOLANT SYSTEMS WITH

RUTHMAN GUSHER COOLANT PUMPS



1810 READING RD., CINCINNATI, OHIO

USE READER SERVICE CARD: INDICATE A-5-204-2



EXCLUSIVE FEATURES

- 1. Saves time one hand operation "lift, slide, lock!"
- 2. Saves tooling expense smaller, simpler jigs.
- 3. Saves space in tool crib.
- 4. Indispensable for toolroom work in addition to production.

SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS.

new literature available

CARDINAL MACHINE COMPANY GLENDALE, CALIFORNIA

USE READER SERVICE CARD; INDICATE A-5-204-3

Versatility and Quick Change-Over on a wide range of work...



GREENLEE

Automatics

When our reporter visited the busy shop shown above, he found that the battery of four GREENLEES was used mostly in making parts for DAS- Unions - a specialty product of the concern. These unions are low-cost pipe fittings, featuring a pressed-insert bronze seat, that will hold pressures up to 300 psi for steam and 750 psi for water. (This high capacity permits distributors to minimize their number of items for a wide range of requirements.) The concern also does a great deal of jobbing work, much of which is now "classified". Owners and operators alike expressed their satisfaction with GREENLEE machines and service, also indicating the GREENLEES are "easier to work on". With their quick changeover features, the GREENLEES are an important factor in holding down costs on the component parts required for the DAS Union line.

GREENLEE BROS. & CO.

1985 MASON AVE., ROCKFORD, ILLINOIS



Production-line tooling data for the seat end of a 34" "DAS" Union, as run on a 1%" Greenlee Six-Spindle Automatic, is as follows:

Position	Cross Slides	Main Tool Slide
1	Rough Form	Form Drill 13/6" dia.
2	Finish Form	Drill 3/8" dia.
3	Knurl	Form Ream
4		Thread 11/2" OD
5	Break down part way for cut-off	Tap ¾" pipe thread
6	Cut off	
Cycle Time - 14 sec.		Production — 257 pcs. per hr.

REENLEE

MULTIPLE-SPINOLE DRILLING, BORING, TAPPING MACHINES .

AUTOMATIC SCREW MACHINES

AUTOMATIC TRANSFER PROCESSING MACHINES



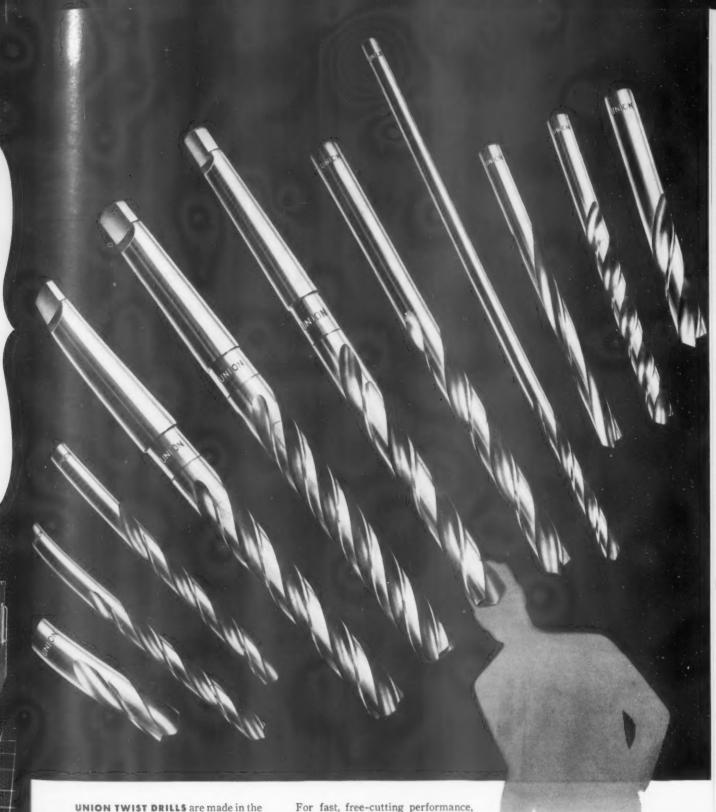
NEW PRODUCT DESIGNS DEMAND NEW MACHINING METHODS

This New Britain Automatic developed for contour facing jet compressor wheels

AUTOMATIC BAR AND CHUCKING MACHINES - PRECISION BORING MACHINES

LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES





UNION TWIST DRILLS are made in the broadest range of types, to cover every drilling operation — no matter what your material or drilling equipment may be.

For fast, free-cutting performance, minimum breakage and more work between re-sharpenings, see your Union Distributor for the drills that are *right* for *you*.

FIRST TEAM IN CUTTING TOOLS . . .

I MIDN and your Local Distributor

WELCOME TO OUR BOOTH 341, 339 AND 337 AT THE TRIPLE INDUSTRIAL SUPPLY CONVENTION

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS . Milling Cutters . Gear Cutters . Twist Drills . Hobs . Reamers . Carbide Teels

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates... BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers, Twist Drills... BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates

Every Top Management Man...In Every Industry

MOST CRITICAL EMERGENCY IN OUR COUNTRY'S AFFAIRS

- **Q.** Why is iron and steel scrap a matter of importance to me?
- A. Steel for our country's military program and civilian economy is being produced at the annual rate of 107,000,000 tons in 1951...119,500,000 tons expected in 1952. Steel-making capacity is being increased now to meet those quotas.

What Do I Get For My Scrap?

In addition to being paid for your scrap, you remove nuisance inventory from your plant—saving valuable floor space. Also, you have a better chance of getting new steel or steel products. But, most important—you help alleviate a dangerous condition threatening our country's capacity to rearm and satisfy civilian requirements at the same time.

- **Q.** How does scrap figure in the production of steel?
- **A.** Steel is composed, generally speaking, 50% of pig iron, 25% of "production" scrap (that is, the scrap which is produced as a by-product of steel-making) and 25% of "purchased" scrap.
- Q. Is scrap getting scarce?
- **A.** Yes. The supply of *purchased* scrap is not increasing fast enough to meet the needs of increasing steel production.
- Q. What if the needed scrap isn't obtained?
- A. Open-hearth furnaces will not be

able to operate at capacity. That will mean a loss of steel production... and fewer products made of steel.

- **Q.** Why not use pig iron instead of scrap?
- A. Every ton of scrap conserves approximately 2 tons of iron ore, 1 ton of coal, nearly ½ ton of limestone and many other vital natural resources—to say nothing of the extra transportation facilities that would be otherwise required.
- Q. How can more scrap be furnished?
- A. By everybody pitching in—as we always do in every emergency—and searching out all possible sources of scrap.
- Q. What are these sources?
- A. Metal-fabricating plants normally

What
Is
Scrap?

Every pound of idle metal is needed to keep our steel mills operating at top capacity. Sell your idle metal to a local scrap dealer right away.

turn over to scrap dealers the scrap left from machining. But there's not enough of this to fill our present enormous need. So everybody—both in and out of the metal-fabricating industries —must sell scrap in the form of idle metal.

What Do I Do First?

Write for free booklet. It tells how to set up a Scrap Salvage Program in your plant. Thousands of plants are cooperating. Do your part now! Address Advertising Council, 25 West 45th Street, New York 19, N. Y.

- **Q.** We don't produce scrap—how can we help?
- A. Scrap is any kind of iron and steel that's gathering dust—obsolete machines or structures, jigs and fixtures, pulleys and wheels, chains and track, valves and pipe—anything with rust on it or dust on it. Non-ferrous scrap is needed, too.
- Q. What do we do with it when we find it?
- **A.** Use your normal channels or get in touch with a recognized scrap dealer.

, by

AID DEFENSE

MORE SCRAP

TODAY...

MORE STEEL

TOMORROW

This advertisement is a contribution, in the national interest, by

THE TOOL ENGINEER

AMERICAN SOCIETY OF TOOL ENGINEERS

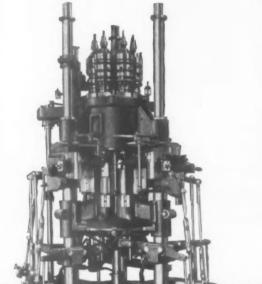
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TAVANNES

THE IMPROVED 6 SPINDLE PRECISION

AUTOMATIC LATHE



VERSATILE_SIX rotating end tools and SIX cross tool slides.

ECONOMICAL Both in tooling and set-up expense; uses comparatively little floor space.

EFFICIENT_High production, with built-in precision to meet exacting standards.

UNIQUE DESIGN_Vertical arrangement reduces wear of moving parts. Gravity bar feed requires no feed fingers, reduces load on spindles, minimizes vibration and noise.

CHUCKING OPERATIONS

. . . can also be performed to great advantage. Vertical design permits easier loading and holding of work pieces.

GYROMATIC SIX-SPINDLE VERTICAL LATHE

(Shown without bar carrier and oil guards)

Typical work piece taken from bars; capacity to 254" dia. and 6" long.





AMERICAN REPRESENTATIVES

292 MADISON AVENUE, NEW YORK 17, N. Y.

(CALIFORNIA, OREGON, WASHINGTON)

2820 LEONIS BLVD., LOS ANGELES, CALIF.

Severance Kegrinding Service A HIGH SPEED and CARBIDE A

CONSERVE STRATEGIC MATERIAL!

YOUR DULL





REGRIND : MIDGET MILLS, COUNTER SINKS END MILLS, MILLING CUTTERS, PINKING CUTTERS ETC. START USING THIS MONEY SAVING SERVICE NOW!

SeveranceTool Industries

728 IOWA AVE., SAGINAW, MICHIGAN USE READER SERVICE CARD; INDICATE A-5-210-1

KAUFMAN

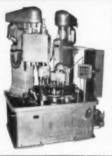
Every machine precision-built to meet the requirements of individual production jobs. Designed with fully automatic cycle, single or multiple spindle heads and other most advanced features.

Write for complete information

KAUFMAN MFG. CO.

MANITOWOC

WISCONSIN



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USE READER SERVICE CARD; INDICATE A-5-210-3

#2 IMPERIA UNIVERSAL TOOL &

Equipped with 4 A.C. Motors and arranged for external and internal grinding with automatic table movement. Accommodates No. 50 National Standard and B. & S. No. 12 taper shanks. Coolant system for wet grinding and radius dressing attachment are standard equipment.



iwing over table10"
Distance between centers20"
Surface of table5"x32"
ongitudinal movement 1314-
spindle speeds, RPM - 2900 to 5800
Net weight1,050 lbs.

PROMPT DELIVERY

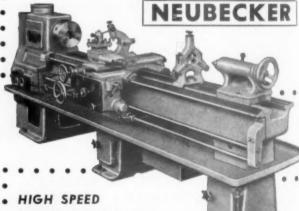
Illustrated Quotation will be sent upon request

ACHINE COMPANY, INC.

PIONEER STREET . BROOKLYN 31, N.Y. TEL. TRiangle 5-2103 & 2157

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CISION + PRODUCTION



PRODUCTION LATHE

TYPE 190 P

Swing 151/4". Speed range from 70 to 2000 RPM.

Distance between centers 40", 60" or 80"

Stepless regulation of spindle speed and feeds.
 Main spindle lodged in three special roller bearings.

VERY LOW PRICE • PROMPT DELIVERY
NO PRIORITY NEEDED • SPARE PARTS AVAILABLE

We also carry screw cutting engine lathes, turret lathes.

copying lathes; quotations on request.

COLUMBIA EXPORT COMPANY, INC.

MACHINE TOOL DIVISION

501 FIFTH AVENUE

NEW YORK 17, N. Y. .

MUrray Hill 7-7460

USE READER SERVICE CARD; INDICATE A-5-210-5



ups tool tip brazing 135% . . . replaces two units

Production brazing of carbide tip tools has soared from 270 to more than 600 an hour since Wendt-Sonis, Hannibal, Mo., tool manufacturer, installed a Lindberg induction heating unit.

Two operators, fluxing parts and putting brazing metal and carbide tool tips in place, load the assemblies on a conveyor belt that passes a continuous stream of work through a specially designed, long hair-pin type heating coil.

Production is speeded because 14 tool assemblies . . . not just one . . . are in the heating field at any given time. The first tool on the conveyor passes from the heating area, leaving 13 others still in the field of heat, with tool number 15 just entering the coil area.

Production, formerly through two smaller units, totalled only 135 tools per hour, per unit, and required four operators. Thus the

new equipment frees two operators for other important work.

If your requirements call for production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting, a Lindberg induction heating unit can better your production picture . . . minimize costs . . . increase profits.



Ask for a copy of Bulletin 1440. It pictures and describes standard models . . . illustrates 11 cost reducing features . . . lists applications . . . shows accessory equipment.





HIGH FREQUENCY DIVISION

Lindberg Engineering Company, 2466 West Hubbard Street, Chicago 12, Illinois



3 Dimensional Performance

Moving freely in three dimensions, the compound table of the New Cleveland Type ER Tapper is another triumph of Cleveland engineering. Moves freely on ball bearing race-ways . . . 40" lateral travel . . . 24" travel front to back . . . compound a 24" bolt circle . . . 18" vertical travel is by motor drive . . . solenoid lock up of table.

Check these Cleveland Features

Fidelity of thread from the first thread to the last thread ...ease of operation ... all controls at finger tips ... precision depth control ... hardened and precision ground lead screw ... heat treated alloy spindles ... speeds quickly changed ... rigid construction ... added tap or die life.

Write for your copy of Catalog T-15

Mr. Lead Screw says: Do you want High Production? Close Tolerances? Increased Profits? Install CLEVELAND TAPPING MACHINES. CLEVELAND engineers are at your service.



CLEVELAND TAPPING MACHINE CO. A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC. CANTON 6, OHIO

USE READER SERVICE CARD: INDICATE A-5-212-1



AND INSPECTION in GEAR PRODUCTION

BURNISHING

THE FELLOWS GEAR SHAPER COMPANY, SPRINGFIELD, VERMONT

USE READER SERVICE CARD; INDICATE A-5-212-2

ATTENTION MANUFACTURERS OF METAL WORKING EQUIPMENT

We are offering the service of our Export department to manufacturers of Metal Working Equipment seeking expansion of foreign sales. INTERNATIO founded in "1863" has branches and subsidiary companies on five continents. We act as your Export department . . promote your product . . handle shipment, insurance, financing. Upon request a brochure of present activities will be forwarded.

Write Dept. Export (6)

INTERNATIO ROTTERDAM INC.

61 BROADWAY, N. Y. 6, N. Y.

BOSTON OFFICE

75 FEDERAL STREET BOSTON 10, MASS.

SAN FRANCISCO OFFICE

351 CALIFORNIA ST.

USE READER SERVICE CARD; INDICATE A-5-212-3

AUTOMATIC SPINDLE **ALIGNMENT**



reaming.

On tapping and reaming jobs, the Ziegler Tool Holder has demonstrated its value to thousands of users by speeding up the job of aligning the work with the spindle.

With the Ziegler Holder it is not necessary to take the time to make an absolutely perfect set-up. It is sufficient to align the work within 1/32" of center on the radius or within 1/16" of center on the diameter, and the Ziegler Holder automatically compensates for the difference.

The labor cost that the Ziegler Holder will save you will pay for the holder many times over in a surprisingly short time. Write for literature giving complete information.

M. ZIEGLER TOOL COMPANY 13574 Auburn

Datroit 23, Mich.



USE READER SERVICE CARD: INDICATE A-5-212-4

The Tool Engineer

Give Your Ejection Problems the Air

OLS

...and boost production and safety

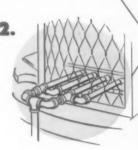
End slow, dangerous hand removal of work with a Schrader Air Ejection Set. Install Schrader Air Ejection Sets on your power presses—or any machines with moving parts to actuate a cam or sliding tripper. You'll find production soars—up to 100%... operator safety is boosted 50%. Replace hand removal with Schrader Air Ejection and watch your presses take a new lease on life.

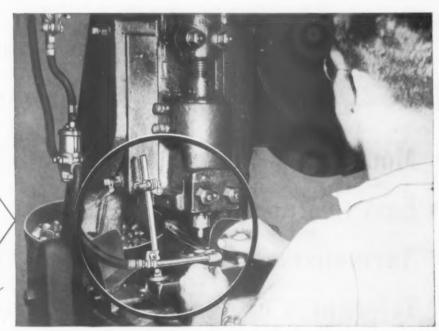
Replace wasteful, homemade steady air blasts with Schrader Air Ejection Sets. Air costs drop as much as 90% because Schrader Air Ejection Sets ration out just enough air to do the job... synchronize your air blast with demand. Before you decide your old compressors have reached full capacity, check with Schrader to see how to cut air waste.

Schrader Air Ejection Sets are delivered fully assembled and ready to go to work. Their low cost is more than repaid in just a few weeks.

See how Schrader Air Ejection Sets will help you plan more effective use of machines. Write, describing the machines on which their use is contemplated—or fill out the coupon below.









products

Mail This Coupon Today

control the air

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
462 Vanderbilt Avenue, Brooklyn 17, N. Y., Dept. H-2

I am interested in more information on.....

Name

Company____

Address



Jigs and Fixtures that are easier to handle increase production. Alcoa Cast Aluminum Tool and Jig Plate is lighter...easier to machine. And is available for immediate delivery*

- ► Moderately Priced. About \$4.00/square foot
- **►** Easy to Machine
- ► Normalized...Strain Relieved
- ► Tolerances on Plates of thicknesses from 1/2" to 4", held within ±.010"
- ► Widths and lengths: cut to any desired dimensions up to 48" x 96"

** For more information on Alcoa Tool and Jig Plate, contact your local Alcoa sales office . . . or Aluminum Company of America, 1952-E Gulf Bldg., Pittsburgh, Pa.

ALCOA



TOOL AND JIG PLAT

FREE Cylinder Catalog and Templates offered by Ortman-Miller Co.

Book outlines several special features of O-M cylinders.

FREE

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SPECIAL FEATURES

Included are detailed explanations of the many features which have made ORTMAN-MILLER cylinders standard in thousands of plants throughout the country. Detailed drawings and copy explain the special shear bar assembly which completely eliminates bulky end caps and tie rods, thus saving up to 1/3 in space. In addition, it shows the vast number of interchangeable mountings and applications which almost always eliminate the need for special castings or patterns. This feature alone not only saves initial costs, but cuts down on inventory and greatly speeds up delivery on every order.

Special Note: 30 DAY DELIVERY

Increased production facilities and standardization of parts continue to make possible delivery in 30 days or less on almost all orders for O-M cylinders. Write today for details.

FREE TEMPLATES

In addition to the FREE catalog, Ortman-Miller also leads the field in making available FREE TEM-PLATES of all O-M cylinders. Prepared in half scale, they are extremely useful in design and application of O-M cylinders to your special requirements.

For your FREE Catalog or templates, use the coupon in the ad at the right. Or write to ORT-MAN-MILLER Machine Co., 1216 150th St., Hammond, Indiana.



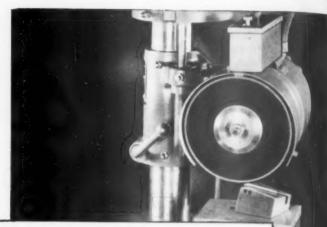




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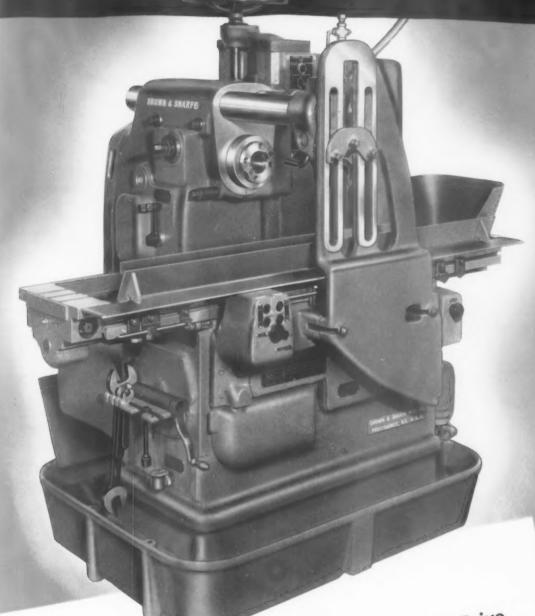
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3 and 71/2 h.p. (Illustrated) Spindle Drive No. 12 PLAIN MILLING MACHINES power movements, wide variety of automa-

Designed throughout for higher productivity of medium-size precision parts, these machines are "Productioneered" to pay off in maximum production for you.

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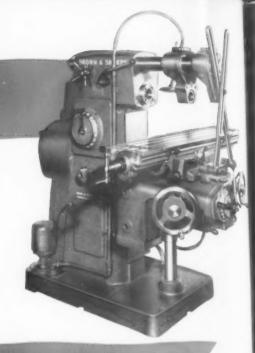
See next page for other Brown & Sharpe "Productioneered" Milling Machines.

Brown & Sharpe



No. 2 Plain Milling Machine, 5 h.p.

Tri-motor drive, column-and-knee type design and extended spindle face give this machine additional set-up and handling flexibility...permit exceptional operating efficiency. (Same features in 3 h.p. machine).





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for economical, fast production of small parts

No. 000 Plain Milling Machine

Simple set-up, fast operation, consistent accuracy for production of small parts for firearms, radios, sewing machines. etc. Uniform positive feed assures long cutter life.



Productioneered

for versatile vertical milling

No. 2 Vertical Milling Machine, 5 h.p.

In addition to the usual features of a vertical, this machine incorporates the versatile swiveling head, making it possible to mill or drill at angles, either by hand or power, and without special fixtures. (Same features in 3 h.p. machine.)

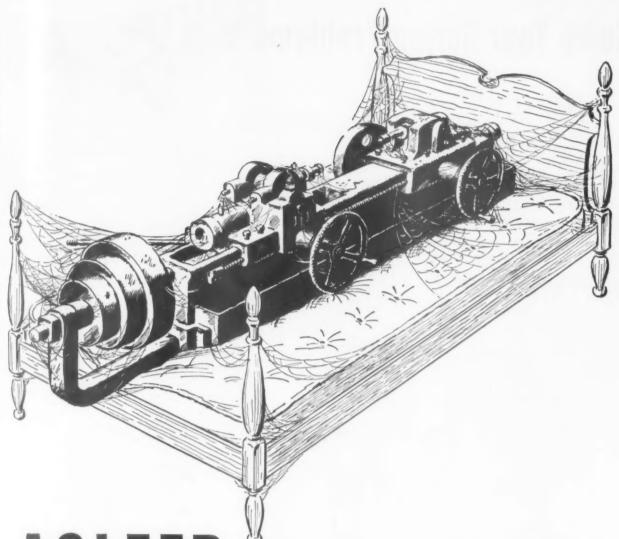


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ASLEEP...on your time



An obsolete or worn-out machine, stuck away, sleeping and forgotten in a corner of your plant, is costly.

It is not doing you or anyone else any good. It is taking up valuable space.

Call in a scrap dealer and let him haul away your dormant scrap. It will help to supply the tons of additional scrap that is needed if the country's steel furnaces are going to continue working at full capacity.

Today there are millions of tons of dormant scrap hidden away in plants and factories, and on farms.

If the steel mills can get that scrap, the steel supply picture will be very much brighter, with more steel for everybody. Call in a scrap dealer today!

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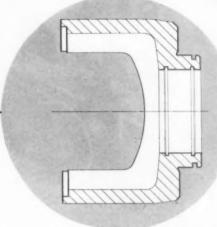
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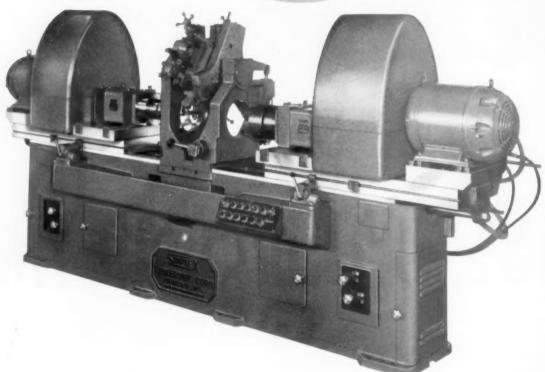
Simplex

DOUBLE ACTION
for INCREASED
PRODUCTION

Face, counterbore and chamfer



Bore, face, chamfer, recess, turn and groove



A manufacturer of precision machine parts solved the costly and difficult machining operations on the part shown in the insert using a SIMPLEX 2U 2-Way Hydraulic Feed Precision Boring Machine equipped with two #4 SIMPLEX Precision Boring Heads. A three-station trunnion type indexing fixture supported the part while automatic feed-out facing and grooving quills performed the necessary machining operations.



PRECISION BORING MACHINES

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PRECISION BORING MACHINES

PLANER TYPE MILLING MACHINES

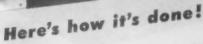
SPECIAL MACHINE TOOLS



• The girls in the picture are just ordinary unskilled workers. But they easily turn out transformer connectors, beautifully brazed, 560 per hour.

You can get similar happy results with EASY-FLO or SIL-FOS on your brazing jobs by following the same simple formula—preplace the alloy and use a fast heating medium with a set-up designed to keep assemblies moving to and through the heating station in a steady flow.

WE'RE READY TO HELP YOU PLAN YOUR BRAZING JOBS. Our field engineers have helped manufacturers in every industry plan hundreds of ferrous, non-ferrous and dissimilar metals brazing jobs, from joint design right through into production. We're ready to do as much for you—without obligation of any kind. Just contact our nearest office or agent and say when you would like a field engineer to call.





Assemblies consist of a drawn copper cup and a copper casting brazed into it with a ring of EASY-FLO wire. Girl on right fluxes parts and loads them on supporting prongs on table which rotates at a predetermined speed. She also removes brazed mined speed. She also removes brazed assemblies. The other girl inserts the EASY-FLO rings. Brazing takes place automatically as assemblies pass over the natural gas burners located around half the table circumference. It's as simple as that.

VALUABLE BRAZING PRODUCTION DATA IN THIS FREE 24-PAGE BULLETIN

This bulletin gives full details about low-temperature silver alloy brazing plus a lot of useful information about joint design and fast production methods. Write today for a copy of BULLETIN 20.

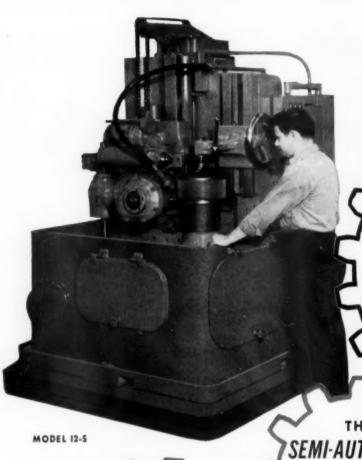


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FASTER, BETTER, MORE ACCURATELY

SEMI-AUTOMATIC

GEAR HOBBING

The pioneers of gear hobbing machines in this country have done it again!

Now Lees-Bradner brings you the ingenious Model 12-S automatic gear hobbing machine

with the electric hob shifter.

This amazing machine produces gears of maximum accuracy—including right or left hand spur and helical gears up to 45°.

After loading, it is necessary only to press the starter button and the hob is fed automatically across the face of the work at constant speed. At the completion of the cut the machine stops for reloading. Hence, one unskilled operator can easily handle a battery of these machines.

If production time and accuracy are at a premium in your plant it will pay you dividends to talk to your Lees-Bradner representative—soon.

FEATURES AND SPECIFICATIONS

L-B patented Hob in-out mechanism

L-B electric hob shifter now available on the LEES-BRADNER Model 12-S

Rated capacity in steel 4 DP Maximum diameter capacity,

Travel (Max. face width) . . 16"

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They're PRECISION GROUND-FROM-THE-SOLID

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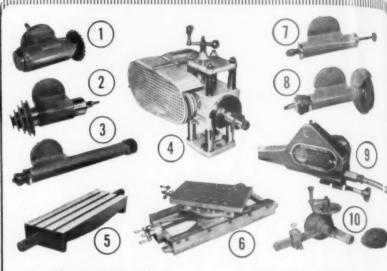
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- Milling and Grinding Table
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MODEL "C," 1/3 hp - 9" TO 13" LATHES MODEL "B," ½ OR ¾ hp — 13" TO 18" LATHES MODEL "M," 1 OR 1½ hp — 18" TO 72" LATHES

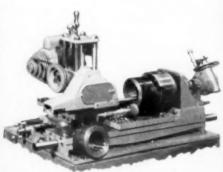


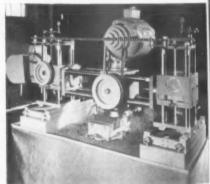
The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating, both internal and external. Therefore, the Master with its full complement of equipment is an outstanding value for general purpose use in maintenance, repair, tool room, and experimental shops, as well as production, thus providing equipment that performs a full range of shop operations at a minimum investment. These improved models of Master attachments are outstanding in rigidity, capacity, and simplicity of set-up and operation and incorporate the latest features developed in our seventeen years of manufacturing this tool. Investigate this valuable shop tool. For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries.

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End Milling 21/2" keyway in 97/8" diameter shaft





Master portable key seating and slotting head cutting

Master portable milling machine made from standard

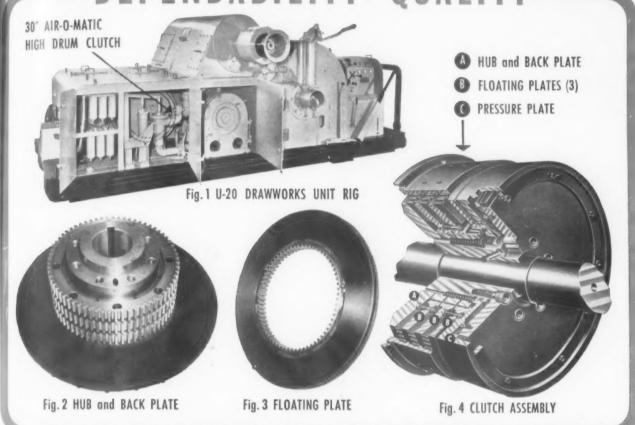
Master components, variable post lengths. Power ted

universal head



WRITE FOR NEW ILLUSTRATED 24-PAGE CATALOG

In the New Unit Rig Drawworks Drum Clutch MEEHANITE CASTINGS MEAN DEPENDABILITY - QUALITY



The proof that in important new designs and improved products such as the U-20 Unit Rig (Fig. 1), manufactured by Unit Rig Company, Tulsa, Oklahoma, Meehanite castings are regularly meeting rigid specifications is quickly provided by this example.

A feature of the U-20 Rig is a 30-inch Air-O-Matic clutch vital to its smooth dependable operation. In this clutch the following Mechanite castings are specified:

Take YOUR Casting Problem To A MEEHANITE FOUNDRY

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- 1. Hub and back plates (Fig. 2)
- 2. Floating plates (Fig. 3)
- 3. Pressure plate (Fig. 4)

To these components Meehanite castings contribute high strength, good anti-friction properties, machinability and uniform high quality.

For proof that Meehanite castings can improve your product write for the Meehanite Handbook.

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For over twenty-one years this company has manufactured the Parker Spindles used in Precision Grinding, Boring and Milling applications. Supplementary products include the well known line of Parker-Majestic Internal, External, No. 2 Surface and Rotary Surface Grinders.

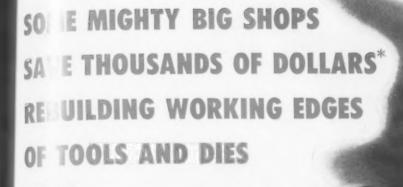
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R AND L PRECISION TOOLS FOR AUTOMATIC AND HAND SCREW MACHINES



When the R and L Turning Tool was introduced to screw machine men in 1936, it was quickly recognized for what is—a well engineered tool with FOURTEEN TURNET TURNING APPLICATIONS that could reduce both tooling costs and tool inventories without sacrificing quality production.

Succeeding years have proven the value of this multi-purpose design and since then other tools, listed below, have been added to the line for application to all classes of work and to a wide range of machines. In many shops they are considered to be the standards.

Today R and L Tools stand a major manufacturer of quality screw machine tools, capable of supplying most of your requirements in tools ranging from $\frac{5}{8}$ inch shanks to $\frac{11}{2}$ inch diameter shanks.

Send for our 28 page catalog-T showing specifications and current prices and learn what the R and L Line can do for you.

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X marked the spot, high on the performance chart. That's where Company A's production curve should have gone.

Alas, it went down instead!

"Just what you'd expect," said the foreman.

"This job calls for pretty near gage-block precision. To get that you have to sacrifice speed, don't you?"

Well—Company B had a similar job. Their production showed an up-curve.

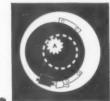
How were they doing it?

Company A found the answer in the new booklet, "SOLVED: The Production Up-Curve Mystery." It tells how to do high precision metal-working at top production speeds . . . Write for your copy today.

A PLANETARY FORM MILLER;
A PLANETARY THREAD MILLER; and
A COMBINATION FORM and THREAD MILLER
FOR BOTH INTERNAL AND EXTERNAL OPERATIONS



The work (dotted white circle) does not revolve. Cutter is revolved around work.



For internal thread and form-milling, cutter (A) moves out from center to contact with work.



3.
Cutter moves in circle, completing cut;
rapid reverse returns
cutter to center.



4.
For external milling cutter moves in to contact work; then moves around work.



· REQUEST FORM

PLAN-O-MILL CORPORATION

1515 E. Eight Mile Road Hazel Park, Michigan

Please rush my copy of, "SOLVED: The Production Up-Curve Mystery"

Name_____Title_____

Address



This tough job solved with a LECO CHIPPING HAMMER

The sheet metal post you see here connects two sections of a metal partition for hospitals.

This post drives on channels to a tight friction fit. The finished assembly is rugged, clean and simple—but there was a difficulty.

Various methods of driving the post in place were tried. All were slow and costly. Furthermore, posts frequently buckled as a result of the pounding.

A Cleco "M" Chipper solved the problem. The short, fast blows drive the posts quickly and smoothly without damaging either posts or partitions.

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Here's all the information you need on Spark Testing to quickly identify standard tool and die steels. This new, 20-page Carpenter Guide to Spark Testing will help you . . .

- 1. Separate mixed tool steel stocks.
- 2. Double-check the type of steel before starting to make a tool or die, and before heat treating.
- 3. Segregate tool steel scrap for salvage.

To help conserve steel and avoid heat treating errors that are costly in time, labor and money, put Carpenter's new Spark Testing Guide to work in your plant. This guide is offered free to tool steel users. For your copy, clip and mail coupon, now. THE CARPENTER STEEL COMPANY, 154 W. Bern St., Reading, Pa.

Individual spark diagrams on Carpenter Matched Tool and Die Steels plus effect of various elements on spark characteristics, are clearly described in this new guide. Instructions are also given for Spark Testing procedure; effects of wheel speeds and grain size, dressing the wheel and pressure required.



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To help us get this guide to you personally, be sure to include your

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= May, 1952 =

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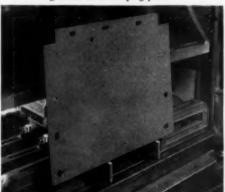


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A typical press brake setup of Wales Hole Punching and Notching Units,



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